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EDITORIAL NOTES.

Victory!

THE gas industry stands to-day completely victorious in one of the severest fights that it has been called upon to face in Parliament, under singular and stubborn circumstances, in defence of its liberties and rights; its opponents, the chemical manufacturers, stand as completely defeated in a straight fight over clear issues as it is possible for them to be. The independent and impartial tribunal appointed jointly by the two Houses of Parliament to determine definitely those issues, and which tribunal was presided over with adroitness, courtesy, and an absolute freedom from bias, by Mr. J. W. Hills, in their report (reproduced *in extenso* in other columns) show a masterly appreciation of the whole position; and this, and the patient hearing they accorded to both sides throughout the six days' sittings, bestow upon their declarations a decisiveness which will perpetually hold good. Let us at once draw attention to the parts of the decision that are most essential to the gas industry. It was admitted by the chemical manufacturers that gas undertakings should be, as the ground of prescriptive right, allowed to work up their own residuals, and to buy, whether from other gas undertakings or elsewhere, the materials required for the treatment of such residuals. The Committee support this. Then follow the two really important clauses in the findings. The first one, in the words of the Committee, is:

> They consider further that one gas undertaking should be allowed to purchase the residuals of other gas undertakings, in order to manufacture other products of the same kind as the purchasing undertaking is manufacturing from its own residuals.

This is subject to a qualification which does not in the least alter the existing practice or liberty, and which refers to a matter quite beyond, as the Committee recognize, the intentions of the gas industry, but with which they deal as a safeguard against the industry entering at large into the business of chemical manufacture. We will presently refer to this more particularly. The Committee proceed:

> They further consider that gas undertakings should, in addition to buying residuals from other gas undertakings, be authorized to buy, from gas undertakings or elsewhere, the materials required to work up the purchased residuals.

The two clauses to which we have given prominence confer upon the gas industry all that it has been fighting for. The industry did not seek the fight; it was forced upon it. And it has come out of it triumphant, to the confusion of those who were the aggressors. All that the industry requested, in response to the unjustifiable claim of the chemical manufacturers to exclusive markets for themselves as buyers of the liquid products and spent oxide of gas-works, and to restricted markets for the sellers of those products, was that the right of gas undertakings to interdealings existing prior to the session of 1912 should be preserved to them; and full agreement with that is the considered verdict of the Joint Committee. This verdict, in short, establishes the *status quo*, and gives a definition to the clause that appeared in the Model Bill previous to that issued for next session.

The Committee, however, think that some restriction should be placed on the gas industry; and in this they have regarded the position prospectively and in the light of possibility rather than in that of any expressed or latent design on the part of the industry. Cheerfully will the gas industry abide by, and even concur in, the view that "gas " undertakings should not be allowed to manufacture chem- " icals exclusively from raw materials bought from sources " other than gas undertakings, or in the manufacture of " which the use of residuals produced by themselves or " bought from other gas undertakings is merely subsidiary." There has never been any intention, on the part of any unit of the gas industry, to make the trade of chemical manufacture its more important business; and it would be wholly impossible for any undertaking to do so under competitive conditions—conditions which the Joint Committee have, in effect and properly, said should be perpetuated in their entirety. If it had been practically possible to make the secondary business the superior in point of volume and value, the decision of the Committee in this particular regard would now completely bar any inference as to the possession of, or any parliamentary application for, that power. Bearing upon this point, the Committee do not deal with the subtle suggestion put forward—solely with the intent to magnify the case of the chemical manufacturers, and to distort the real position—that gas undertakings might make the trade of chemical manufacture their more important business. As the Committee point out, no evidence was produced to lead them to anticipate any such action; and this fact alone was sufficient to show them the hollowness of the submission. The production and the sale of gas must always be the primary business of a gas undertaking. If any attempt was made to reverse the relative positions of the two branches of the business, then such an attempt would be foiled by the express disapproval of the Committee. But the remoteness of any such contingency is so apparent to them that they are satisfied that this aspect of the question can be better dealt with when, if ever, it arises than now. It is not within the realm of probability that Parliament will ever be asked to pronounce upon any such proposal.

Those are the essential and the gratifying features of the report of the Joint Committee. On behalf of the gas industry, we acknowledge the thoroughness and the patience with which they have investigated and considered the opposing cases put before them. Had they determined to the contrary, had they set up protection in commodities in which there is now free trading for unrestricted private interests (to the detriment of the statutorily controlled gas industry), had they placed markets and market prices for the raw residual products under the control of the chemical manufacturers by closing markets to the sellers, while maintaining open markets to the buyers, a grave legislative injustice would have been committed. Justice has been done. We congratulate the gas industry, and, in doing so, the Gas Companies' Protection Association, the Institution of Gas Engineers, the Association of Municipal Corporations, and all who have worked hard and have efficiently represented the interests of the gas industry in this matter. May we not also claim, in this connection, that the issue is a complete vindication of the consistent attitude that, from the very opening of this campaign by the chemical manufacturers, the "JOURNAL" took up in this matter, and of the efforts exerted in our columns to stimulate interest and action, in view of the seriousness of what was being subtly done in respect of the future of the industry's residuals markets.

The deliberate findings of the Committee are also virtually a condemnation of what has taken place during this session of Parliament in placing restriction upon several gas undertakings without thorough regard being paid to the broad results upon the industry as a whole in contradistinction to the results upon certain individual gas undertakings. The policy of restriction was never considered by any parliamentary tribunal in all its bearings until the Joint Committee was appointed; and from our very intimate knowledge of the history of gas legislation, it can be asserted that there has never been a more drastic and vicious restriction inflicted upon gas undertakings on such limited consideration as in this particular matter. Precedent was created before the undertakings attacked singly were fully aware of the gravity of the situation for the whole industry; and the chemical manufacturers played upon the easily won (but happily short-lived) victory, claimed the right to the precedent being imposed in every succeeding Gas Bill or Provisional Order, and the Committees one after the other accepted the decisions—decisions given on insufficient investigation—as precedents governing their own individual action. We have, however, to acknowledge the valuable assistance that, after much mischief had been done, the Parliamentary Authorities gave in

securing the appointment of a tribunal that should hear and adjudicate upon the entire cases of the contending parties. The gas industry had no right to, and it could not, accept the position under the circumstances in which the position was created. It would have continued to agitate the matter inside and outside Parliament, until something was done to bring about a full and proper consideration of the question as to whether or not it was entitled to relief from an iniquitous situation, its view concerning which has now been abundantly confirmed by the only tribunal of Parliament who have had the considerations placed fully before them.

The chemical manufacturers cannot complain that they have not had a fair hearing. Never has a Committee of Parliament devoted closer, more patient, or more discerning attention to a question referred to its judgment, and, in this instance, a question of such vital importance to a public-serving industry—an industry whose interests Parliament has wisely, to such a large extent, intimately and materially bound up with the interests of the public. The chemical manufacturers have only themselves to blame for the present and any other results that may follow from their injudicious action. We cannot say what these other results may be. But this is certain, that their action has directed the notice of the gas industry more than anything else could have done to the internal power it possesses of maintaining fair market prices for its secondary liquid products and spent oxide. The chemical manufacturers may see this now that the tide of fortune in the matter of parliamentary restriction has turned against them. But this, from our knowledge of the internal affairs of the industry, we can say, that the power of the industry in this matter will not be exercised more in future than it has been in the past for any other purpose than to secure the best prices in the interests of its parliamentary trust. In the future as in the past, there will be competition; but it may be competition of a somewhat more open order than it has been so far. If it is so, the chemical manufacturers will be taking part in conditions of their own voluntary creation.

What of the future? In the face of this report of the Joint Committee, the chemical manufacturers (who have already by their action caused a serious loss of time and money to the gas industry which can never be recouped) cannot pursue the offensive tactics of the present session in further opposing Bills and Orders. The Joint Committee were appointed to determine the whole question; and Parliament and all future Select Committees will be guided by the findings. The changes that were—prematurely, in view of the appointment of the Committee—made in the Model Clauses, so far as they apply to this matter, can be completely ignored. The chief concern now is for those undertakings that, through their Acts and Provisional Orders, unjustly—the report of the Joint Committee authorizes the employment of such an expression—had restriction imposed upon them. This is a matter that is referred to in a letter from Mr. Charles Hunt in our "Correspondence" columns. The only course that occurs to us at the moment for those gas undertakings to pursue is to promote a Joint Bill to abrogate the restriction. In view of the report of the Joint Committee, Parliament cannot refuse to allow the simplest and most reasonable mode of procedure in undoing the mischief wrought by insufficient consideration and appreciation. Such a Bill could even now be promoted for next session, with a petition praying that the Standing Orders relating to preliminaries should be, in the singular circumstances, dispensed with. A conference of representatives of those undertakings that have been "restricted" this session might perhaps be held. Somebody has to take the first step; and the sooner the better. The mistake of the session should be righted at the very earliest possible moment.

Composition and Work of the Photometrical Commission.

THE question of the reorganization of the International Photometrical Commission is in the air; and the movement appears, according to a brief reference to the subject in our transatlantic contemporary "Good Lighting," to be under serious consideration. It is also stated that the movement is being well received both in Europe and America. There have been previous indications of this movement. In the last annual report of the Council of the Institution of Gas Engineers, it was mentioned that negotiations were in progress for the consideration of the re-constitution of the Commission and of an enlargement of the scope of future work. But information beyond this has not been given. Our American contemporary now says that it is hoped that a new Commission will be formed "which will be equally "representative of, and responsible to, all national tech-"nical gas, electric, and illuminating engineering societies, "and other societies interested in photometry and illumina-"tion matters." We hope so too. But this contemplates something that appears to be in the nature of a contradiction to the feeling that pervaded the meeting of the Commission at Zurich in 1911. If M. Th. Vautier and his colleagues, who represent the various technical gas organizations who were initially and have been (since the International Gas Congress in Paris in 1900) hitherto immediately concerned in the work of the Commission, are viewing with favour such a considerable expansion of their work as is now contemplated, their views have, during the last eighteen months, undergone a very material change. It will be remembered that, at the 1911 conference, there was a discussion regarding the expansion of the Commission by the admission of representatives of electrical bodies concerned in the science of light measurement, and that it was then agreed to invite such representatives to be present at all sessions at which matters of mutual interest were to be discussed (which invitation would therefore naturally apply to all sessions). There was also a distinct feeling on that occasion that the membership should not be allowed to become unwieldy, and that the Commission should not take on its shoulders the burden of more work than could be thoroughly and efficiently done.

The opening of the doors of the Commission to the extent then resolved upon was a very proper step; and this was a sufficient encouragement to hope for more on the part of those who had raised, and have since pressed, the plea that the Commission, and the excellent work already done by it in expanding and co-ordinating photometric knowledge, practices, and values, should form the nuclei of enlarged representation and a lengthening of the range of scientific labour. There seems good prospect of what they desire being eventually consummated. We have designedly used the word "eventually;" for if the formalities are pursued in the routine way that ordinarily follows the reference of a matter of this kind to a Sub-Committee, it will be a long while before any scheme can become an accomplished fact. The Commission will not be meeting again until 1914; and naturally there must be a reference to the Councils of those national gas organizations to which, from its inception, the Commission has been responsible—latterly in conjunction with the national laboratories concerned in the particular scientific work to which the Commission has been devoting attention. If there is good work to be done by expansion, then there will be needless waste of time unless a way is found for the scheme to be completed in time for the Commission, comprehensive of not only gas organizations but cognate bodies, to enter upon a fuller programme of work in 1914.

There can be no question that, with the proper organization of bodies allied in interest, an extension of the work of the Commission is permissible, and would be vastly beneficial, having in view its already highly scientific composition. There are matters in connection with such subjects as the science of light and illumination, other than their measurement, that can be best probed and examined, and the problems surrounding them elucidated, by specialists, and in a far better manner than can be done by men who, though possessing certain knowledge, have not the time, inclination, or capacity to deal with them on the higher planes. What is now proposed is only a natural growth of the work of the Commission. From the very outset, when the aggregate of capacity and training was brought to bear upon the special matters that were initially taken in hand, there has been a gradual expansion of the area of topic that has engaged the attention of the Commission and its Sub-Committees. There is still much uncovered ground for the Commission to work upon; and fresh ground will, by the evolution of knowledge, be constantly revealing itself. It is abundantly obvious, unless there is some extension of the composition of the Commission, and perhaps more frequent conference—so rapid is the progress nowadays of matters concerning light and illumination—that it cannot possibly compass, nor bring its qualified influence and views to bear upon, the many matters of fresh importance that should be referred to, and dealt with, by it. Therefore, although we naturally hope the technical Gas Associations

from which the Commission sprung will (in view of their parental rights) maintain an acknowledged premier position in connection with it, without making this the reason for any intrinsic inequality, we shall anticipate with pleasure any broadening of base that may be decided upon, which will contribute to knowledge and to the good of the industries dealing in light and its applications.

Proposed Factory Lighting Legislation in New York State.

In New York State, factories and workrooms are subject to legislation in precisely the same manner, though probably not in exact form, as in this country; and across the Atlantic, as at home, some of the requirements affecting the regulation of such places, while unquestionably framed originally with the best of intentions, have been somewhat absurd. We may instance at home the prescribed ridiculously low percentage of carbon dioxide in the air of factories, which has promoted stupid attacks on gas, and not on the contributory human occupants, while inadequate ventilation, the real sinner, has not been dealt with so rigorously as intelligent consideration of the subject ought to suggest. There is nowadays no excuse for legislation of this kind, with so many technical bodies at command, who are always glad to act in an advisory capacity, so that legislation may be of a constructive order, and not unjustly destructive. Consultation with such bodies may also prevent the adoption and application of the whims and fancies of individuals who, while claiming to be experts, are nothing but faddists, and know little of practical requirements. Those are people to be avoided by the powers that be in designing rules and regulations. The gas industry has in restrictive legislation felt the influence of such individuals; and it does not want, nor would wish any other industry to have more of them. Collaboration by those who know the practical requirements with those who can advise as to the best way of meeting those requirements is an essential to perfection in matters like the illumination of factories.

We have passed the time when there need be any talk as to good illumination being essential for the prevention of accidents in, and for assisting in ensuring the maximum output of, factories. Those are elementary and obvious considerations. Yet many factory owners avoid the obvious, and go on in the old dark ways, to their own disadvantage and that of their employees. The laggards in the application of progress in methods are those who make necessary legislation to force them to act. There have been ample indications that our own Home Office has entered upon work which will in due course end in legislation regarding illumination in factories and workshops. The last annual report of the Chief Inspector of such establishments embraced very solid indications of this. New York State has gone farther in the preliminaries to legislation. There is already in existence there the draft of a Bill to amend the Factory Acts of the State, and one part of it is intended to empower the Factory Commission to make regulations for the lighting of factories and workrooms. In its present form, the Bill is merely in the nature of a recommendation to be submitted to the Commission; but its terms have been made public by Mr. Abram I. Elkus, Chief Counsel to the Factory Investigating Commission, in order that those competent to do so may make suggestions for the consideration and guidance of the Commission. In this way, Mr. Elkus hopes to obtain a sound basis for both the Bill and the regulations which it will empower the Commissioners to make. As a matter of fact, there need be little, if any, change in the form of the Bill so far as it refers to illumination, as, while in general terms it makes certain things obligatory, it does not prescribe anything in detail, and that is the really important matter, and the matter over which care must be exercised.

The draft measure proposes to enact that all workrooms shall be properly and adequately lighted during working hours; that the artificial illuminants shall be installed and used so that the light furnished will at all times be sufficient and adequate for the work carried on; and that all artificial illuminants shall be so placed and arranged, and shaded, as to prevent strain on the vision or glare in the eyes of the workers. Then the measure proposes to confer upon the Advisory Board the power to prescribe, and modify when necessary, rules and regulations to provide for proper and adequate illumination; and, not only so, but to govern the installation and use of artificial illuminants in different industries, and to fix standards for the minimum amount of artificial illuminants in workrooms. So far, so good. But, as we say, the making of the rules and regulations is the matter of importance, and the one over which care must be exercised; and this can only be done by the help of experts —not only illumination experts, but experts in the practical requirements of the different industries. For instance, illumination is to be proper and adequate. Without individual consideration, there is no possibility of saying what is proper and adequate for different persons, operations, situations, and surroundings. A minimum illumination may be laid down for different operations; but as eyesight may suffer from insufficient illumination, so it may suffer from too great an illumination with the source of light at close quarters. It is indeed a very difficult matter upon which to legislate definitely; and yet rules and regulations will be of little value without some definition—for example, as to "adequate" illumination. It would never do to leave the matter of definition to the personal fancies of the official inspectors. Between them and owners in such circumstances there would be perpetual friction and difficulty. Mr. Elkus recognizes all this; otherwise he would not be asking for the assistance of the advice of those competent to impart it, in order to guide in the framing of regulations. It is interesting to learn of this move in the State of New York. There is good ground for confidence in saying that there will be more proposals for the same sort of legislation not only in other States of America, but in this and other European countries.

Training Staff Officers.

The Junior Institution of Engineers are always favoured in the matter of their Presidents. Men of celebrity in the engineering world deem it an honour to be the President of the Junior Institution, with its membership reaching to the four-corners of the earth. To the line of Presidents there is now added the name of Sir A. Trevor Dawson, the Managing-Director of the world-famed Vickers Company. He delivered his Presidential Address last Wednesday evening; and it is an address alive with the thoughts generated by a vast experience and by foresight, and an address of national importance. It dealt with that well-worn subject of the proper technical training of men in the engineering profession; it pointed to the vast and ever-expanding field of work, strewn with unsolved problems and new requirements, that is lying around; and it treated of the importance of having the best men and the best brain power at the head of affairs—no matter the level in the social scale from which the men and the brain power are derived. We have often heard much the same thing before; but Sir Trevor clothes it all with fresh and stimulating thought. He restricted his attention mainly to staff officers, who are largely directing forces in industrial works, and the ultimate superior officers. Sir Trevor speaks of the clamant national need that there is for high-grade intellect to create new appliances, to improve old apparatus in manufacture, to perfect design alike with regard to its applicability to work, to durability, and to economy. The "clamant national "need" seems to suggest that the present staff officers are as a class below the requisite efficiency in all the stated respects; but Sir Trevor, we imagine—seeing that in the engineering race this country does not stand in relation to others in a bad position—has his eye on the future rather than the present. The need lies in a progressive efficiency, to enable us to maintain our national place; and provision for ensuring this progressive efficiency is what exercises the mind of the writer of the address.

There are many reflections in the deliverance upon the importance of knowledge and practical training being associated in staff officers. They must be well-trained men, experienced in materials, mechanical methods, and men. There is, in kindly way, some criticism of those aspiring to official position, in that they themselves are prone to inflict injury upon their own future by undue haste to obtain a higher salary, or by remaining too long in one job and groove which, for their younger days, pays better perhaps than others, but which limits experience—experience which would be of value in personal equipment for higher positions in later days. Such criticism, of course, is good in its way; but in part it comes up against one of the fundamental conditions of life—that there must be provision for living, if the young engineer in the spring time of his work has no other monetary resources than those that are the fruits of his own brains and hands. Granting it is a national need of the country—and who can deny it?—that the best brain power

should be discovered irrespective of social standing, then, if good brain power is unearthed in some lowly place, and it is to be cultivated for the country's advantage, the only way it can be done is to make provision for maintenance and opportunity during the days when those two essentials, knowledge and practical training, are being promoted, and are serving to furnish the quickening influence for future work. Where are we to look for the provision? Sir Trevor has his suggestion. If it is, as he is convinced it is, a national need that the best brain power should be discovered and utilized, then he claims that it is the duty of the State to "extend its educational system so as to enable the best "youths to enter upon a combined practical and theoretical "training for the greatest of manufacturing industries, with-"out requiring great sacrifices on the part of parents who "might be unable to support their sons throughout the pro-"longed period of training." That is his submission. There is the national want; it should, he holds, be met by national means. There is no narrow, exclusive desire found in the address for this State aid for the provision of creative, inventive, and adaptive men in regard to engineering only; there are other departments in which, in the national interest it should be applied. It is impossible, and would be imprudent, to examine in hasty manner such a far-reaching proposition; and yet at first sight it seems the only way, in cases where skill and brains have monetary restriction placed upon their cultivation and application. As to the area of work that lies around, there is no question; as to the need for maintaining our industrial supremacy, there are no two opinions; as to the means for doing so, there again there is no ground for controversy. Means are found in creative, inventive, and adaptive brains.

Mond Gas Progress.

Without disrespect to the system and those concerned in its technical and commercial development, it may be said that generally the gas industry had almost lost sight of the existence of the South Staffordshire Mond Gas Company; and it certainly fails to keep in mind the local disturbance that the Company's application for parliamentary powers occasioned in 1901, owing to fears as to the effect upon the power business of the industry in the area in which the Company proposed to operate. Occasionally, information has been published as to the financial position of the undertaking, and that position has not produced any particular enthusiasm, nor has it tempted other concerns to commence operations, or new companies to apply for parliamentary powers for a venture having the same objects. But are we now to anticipate that the situation of the South Staffordshire concern is going to serve as an inducement to the flotation of fresh schemes? We hardly know; but anyway most people will be inclined, upon a review of the position, to think that, if any such ideas are lurking in the minds of those interested in the Mond system, those ideas are of rather a premature order. The experiences of the South Staffordshire Company supply a vast area of material for a paper; and it was a spacious communication Mr. H. A. Humphrey made on the subject to the Institution of Civil Engineers last Tuesday, the official abstract of which is published in other columns. In the opening lines of this abstract, there is a very vague statement (which may have another complexion conferred upon it in the full text) which suggests the birth of a notion that the time is opportune for the promotion of other schemes. The eye-arresting words of the abstract are: "The advantages of such a supply "have now been amply demonstrated; and in view of other "schemes of a like nature being carried out in the future, "precise information and data should prove of interest to "the members of the Institution."

This seems to portend an intention to introduce some new scheme. But there are two reasons that would make the public very shy of financially interesting itself in any such proposals. The first is the sad financial experience of the South Staffordshire concern; and the second the fact that in this power gas business in industrial areas, the Company commenced operations when they had for large power uses practically virgin soil upon which to work. The Company began trading in 1905; so that it has been running now for between seven and eight years. But with what financial results? In 1911, a gross profit was made of £8856; the gross profit in 1910 was only about half that sum; and the gross earnings of 1910 only represented just about the amount required for debenture interest. Therefore, a sum equal to the requirement for debenture interest was in 1911 available for the ordinary shareholders, and this allowed of a dividend of 2s. per share being paid. As the shares are of the nominal value of £10 (standing in the market at between £6 and £7), the 2s. is equal to a dividend of 1 per cent. upon the ordinary capital! A sudden jump to double the gross profits in the space of a year, and then only an ability to pay 1 per cent., with probably no immediate prospect of any further considerable consumers coming on to the mains, are not sufficient to stir the public into any deep enthusiasm in the matter of supporting further adventure of the kind. Moreover, conditions have materially altered since the South Staffordshire Company started, as we say on practically virgin soil. The other manufacturing areas of the country have been exploited by the electric power companies; and their connections have largely undermined in those areas the conditions that existed when the South Staffordshire Company commenced their laborious and (for the shareholders) disappointing career. Further north the waste gases of the blast-furnaces are being used as the driving power for the production of electricity. Everywhere the town-gas industry is to-day supplying gas more cheaply in industrial areas for power purposes than it was a decade ago, though of course, under present circumstances, it does not expect to get the business of supplying gas for driving such mammoth engines as those driven by producer gas.

However, the paper by Mr. Humphrey, as are all his contributions on any engineering subject, is of extreme technical interest. It appears clear from the abstract that the costs of such a concern are exceedingly heavy in dealing with and transmitting such large volumes of poor gas—150 B.Th.U. [? gross]—as have to be dealt with; and, while the expenses are heavy, the gas must be sold at an average of 1·75d. per 1000 cubic feet, to make it tempting to the consumers. Mr. Humphrey says that this price is, having regard to the calorific power, equal to lighting gas at 7d. per 1000 cubic feet. Regard for the calorific power only is a somewhat narrow view to take. The abstract does not inform us whether the author showed that this was not the only comparison from the consumers' point of view in respect of over-all costs. However, the fact that the business accrued, after seven to eight years' running, only permitted of the payment of 1 per cent. last year, suggests that the weight of capital is out of all proportion to the value of the business done. When 36-inch and 21-inch steel mains are laid, and carefully laid in view of the subterranean conditions of the area, they cost money; and at the present time the total length laid is only 29·45 miles. Further than this, with the present business earning last year only 1 per cent. dividend for the shareholders, additional capital expenditure is necessary for increasing the existing unit of producers (eight of 20 tons each) by 80 per cent. But, of course, if business can be obtained for the plant extension, it is recognized that the relation of capital to business done will be somewhat improved.

Another interesting point affecting the commercial side of the experiences is that the Company have at the present time some 150 gas-engines connected to their mains; and Mr. Humphrey points to it being a significant fact that practically every suction-gas plant situated near the line of mains has been shut down, owing to the owners finding it more advantageous to take a supply direct from the Company. As a matter of fact, owing to the conveniences and greater reliability of the Company's supply, no less than 45 private producer plants—20 suction gas, and 25 pressure plants—have been abandoned. This may be significant, but it is not surprising. It is a common experience in town gas enterprise, with gas under supply for power at from 1s. 6d. to 2s. per 1000 cubic feet, that those manufacturers who have had suction-gas plants at work, and have learnt from experience of the worries and erratic engine power they entail, are glad enough to change over to the gas of better quality and constancy, and thus enjoy the comfort and advantage of regular power at all times.

Personal.

The Hong Kong Gas Company recently required the services of a foreman gas-fitter, and they selected Mr. John Harrower, of the Glasgow Corporation Gas Department. He was attached to the Clydebank workshops, from the employees at which he has received tokens of goodwill. Mr. Harrower, who is twenty-eight years of age, sailed for the Far East last Friday.

THE RESIDUALS INQUIRY.

A COMPLETE VERDICT FOR THE GAS INDUSTRY.

TEXT OF THE REPORT BY THE JOINT SELECT COMMITTEE OF THE HOUSE OF LORDS AND THE HOUSE OF COMMONS ON "GAS AUTHORITIES (RESIDUAL PRODUCTS)."

1.—The Committee were appointed to consider whether any, and if any, what restrictions should be imposed on gas authorities with respect to the purchase and manufacture of the residual products resulting from the manufacture of gas by other gas authorities, or of other chemicals.

2.—The following bodies were represented by Counsel before the Committee :—

The Alkali Manufacturers' Association, and
The Gas Companies' Protection Association.

These bodies were found sufficient to represent the opposing interests before the Committee; the Association of Municipal Corporations having combined their case with that of the Gas Companies' Protection Association.

3.—This inquiry has arisen owing to proceedings before certain Committees of both Houses of Parliament during the present session, where objection was raised by those interested in the chemical trade to the manufacture and sale of chemical products by gas undertakings.

4.—The manufacture of gas necessarily involves the production of certain residual substances. These substances are coke, ammoniacal liquor, tar, and spent oxide. Ammoniacal liquor and spent oxide respectively contain ammonia and sulphur in large quantities.

In the disposal of these products, two courses are open to the gas undertakings. Either they may sell them in their raw state or themselves work them up into other substances—as, for instance, ammoniacal liquor into sulphate of ammonia, or spent oxide into sulphuric acid. In the case of raw products, the principal purchasers have been the chemical manufacturers. In at least one case, however, a gas undertaking has set up a large plant with the object not only of converting its own residuals, but also of buying up those of other undertakings to convert in addition to its own.

This practice does not appear hitherto to have become a general one; but it is opposed by the chemical manufacturers, who apprehend that it may be extended.

5.—The right so to purchase and manufacture the residual products of other undertakings is governed in most instances by the Private Act authorizing each particular body.

These Acts vary greatly in their terms; and no fixed rule can be deduced from them—the reason being that in most cases the point was not material when the Act was passed. Speaking generally, however, the practice of Parliament up to the present session was to allow the purchase of residuals by one gas undertaking from others; and this is evidenced by the terms of the Model Clause which is ordinarily inserted in every Unopposed Bill. As a result, however, of the decisions of the several Committees of both Houses above referred to, this clause has now been amended so as to prohibit the purchase by one gas undertaking of the residuals of another; and this prohibition can be put upon existing undertakings who now have powers to purchase, if they have cause to come to Parliament for further private legislation.

It is in order to ask for a definite decision on the subject that the parties appear before the Committee.

6.—The contention of the chemical manufacturers is that they rely almost entirely on gas undertakings for their raw material; that they would lose their main source of supply; and that a gas company, like a railway company, has a definite scope, and exists for an object to which it should be limited, and which does not include the business of a trader in and general manufacturer of chemicals.

They contend also that gas undertakings are specially favoured by Parliament, since they have a monopoly of the supply of gas in their areas, and consequently, if they are Statutory Companies, can raise their capital on easy terms, while if they are Local Authorities they have the assistance of the rates.

While they are prepared to concede to the gas undertakings the right to manufacture their own residual products, and raise no objection to their purchasing (either from each other or in the open market) materials and chemicals required for such manufacture, they strongly resist any claim on the part of the undertakings to buy from each other raw materials for the purpose only of working them up.

They allege that a gas undertaking, by reason of its favoured position, and because its main object is the making of gas, from which it derives its main revenue, can afford to cut the profits on what is only a subsidiary branch of its business, and will either pay excessive prices for raw materials bought from other undertakings or will sell its resulting products at an unduly low price, in both cases competing unfairly with outside traders.

7.—The gas undertakings, on the other hand, argue that in most cases, under the sliding-scale which controls the price of gas, any reduction in the cost of manufacture mainly benefits the consumer, and that cheap gas is of great benefit to the public; and they contend that by selling to each other residuals in order that they may be worked-up, a larger profit is secured both to the selling and to the buying undertaking.

They contend further that while the restriction of gas undertakings to working-up their own residuals might not damage seriously the larger undertakings, which produce residuals in quantities sufficient to render possible manufacture on a large scale, it would seriously injure the smaller undertakings, whose production is often too small to justify them in setting up for themselves the various plants required for converting residuals.

They contend, lastly, that if the competition of gas undertakings as purchasers is eliminated from the market, the price of the material will be fixed by the traders only; and, further, the heavy cost of railway carriage on bulky substances, such as gas residuals, makes it desirable from all points of view that they should be worked-up near home, which is impossible in the case of gas-works situated far away from the works of chemical manufacturers.

8.—The Committee have heard many witnesses and the arguments of Counsel on behalf of each party. They think that some restrictions should be imposed upon gas undertakings, but are not prepared to grant all the restrictions asked for by the chemical manufacturers.

9.—It was admitted by the chemical manufacturers that gas undertakings should be allowed to work-up their own residuals, and to buy—whether from other gas undertakings or elsewhere—the materials required to work-up such residuals; and the Committee support this.

10.—They consider further that one gas undertaking should be allowed to purchase the residuals of other gas undertakings, in order to manufacture other products of the same kind as the purchasing undertaking is manufacturing from its own residuals; but this is subject to the qualification contained in paragraph 12.

11.—They further consider that gas undertakings should, in addition to buying residuals from other gas undertakings, be authorized to buy, from gas undertakings or elsewhere, the materials required to work-up the purchased residuals.

12.—They consider, however, that gas undertakings should not be allowed to manufacture chemicals exclusively from raw materials bought from sources other than gas undertakings, or in the manufacture of which the use of residuals produced by themselves or bought from other gas undertakings is merely subsidiary.

13.—The Committee have not dealt with the suggestion made that gas undertakings might make the trade of chemical manufacture their more important business, since no evidence was produced to lead them to anticipate such action. To this they would be opposed; but they are satisfied that this point could be better dealt with as it arose.

ELECTRICITY SUPPLY MEMORANDA.

Fires at Christmas Time—The Manchester Tests—An Opportunity for the "Illuminating Engineer"—Electric Meter Infirmities—Phantasy by Cramb—"Tricity" Advertising and Capital Requirements—Fixed Prices and Substantial Losses.

CHRISTMAS is close upon us; and there is naturally some little fear in electrical breasts regarding one possible result of the decorative effects that some tradesmen try to obtain by the aid of electricity. The Christmas season has often been an uncomfortable one for the electrical industry, on account of the incendiary proclivity of its commodity. Drapers' shops, Christmas bazaars, and other places have suffered destruction wholly or partially, and lives have been lost at the season of "Peace and Goodwill." Some neurotic electrical engineers get into such a state of fear at this particular season that they send inspectors to make a diurnal examination of any extension illumination work. More than once since certain big fires have occurred near Christmas, insurance companies have issued warnings as to the necessity for considerable care being taken in making Christmas illumination installations in shops. The Royal Exchange Assurance Company have this lighting season issued a caution to some of their clients. "Meteor" in the "Electrical Times" thinks the Company are referring to matches, spills, lighted paper, and so forth. To electricity? Never! We cast our eyes over two or three occurrences of the past few days, without going back to preceding larger fires at electricity generating stations and elsewhere. There has been the small fire in the electrician's department at the British Museum; there has been the destruction of the Epping Town Hall; and there has been the fire in Newgate Street. Last Saturday week, too, a switchboard fire at the St. Denis station deprived a large part of Paris of its electric current, both above and below ground, and Paris groaned beneath its oft-recurring difficulty. The insurance companies are wise in their monitory notice, in view of the mischievous tricks of electricity.

In an editorial in the "Illuminating Engineer," reference is made to the Manchester tests of Mr. Haydn Harrison and Mr. Jacques Abady of the trial high-pressure gas-lamps and electric flame arc lamps. Our contemporary confers credit upon the extended knowledge affecting illumination matters for the fact that the City Council appointed two experts to report to them on the subject of these trials—photometrically and otherwise; but it is obvious that our contemporary, while patting the Council on the back for having given this engagement to two illuminating engineers, in the same line of thought considers the appointment somewhat premature, and there is a sort of doubt found by reading between the lines as to whether the Corporation really obtained value for their money. The ground for this inference is the statement that "until we have something in the nature of a standard specification for street lighting, it is hardly to be expected that strictly comparable data will be obtained by two independent experts, even though they may be anxious to co-operate together." There is redundancy in the "together." But from what is said in the quoted passage, it must be, in the absence of a specification, that, in the intelligent view of the "Illuminating Engineer," the investigation into the trials was premature, and did not give the City Council full value for the money expended. If this is the interpretation to place upon the quoted words, then we are not in agreement with our contemporary. There was a vast amount of valuable information in the reports. And we are not at all convinced that a specification—other than a specification as to the methods to be followed in conducting street photometrical tests—would be of any particular profit. No specification as to illumination can be universally applicable. When our streets and their architectural borderings are all reconstructed to standard conditions, and arrangements can be made for a perpetuity and universality of atmospherical conditions, then it will be possible to standardize the degrees of illumination at 3 ft. 3 in., or at any other level, above the road surface. Our illuminating engineering friends do not seem to have at command the history of expert investigation into street lighting. More than a "few years" ago now, the late Mr. William Sugg, Messrs. Simmance and Abady, and Mr. Dibdin were working as experts at this matter of street lighting; and we believe all four were at various times engaged by local authorities to advise them.

Glad are we to see that our contemporary recognizes that the trial high-pressure gas-lamps at Manchester were not properly equipped; but we do not observe that it refers to a fact of anything but negligible importance to the illuminating engineer that, notwithstanding this defect, these defectively hung lamps were giving an illumination practically equivalent to that of the carefully nursed flame-arc lamps with their plain glass globes, only the outer one of which was slightly obscured at the bottom. It is, however, remarked that our contemporary hopes on a future occasion to go more fully into the merits of these tests and the results obtained. We trust that its hope will be realized, inasmuch as if the "Illuminating Engineer" is true to its principles and those taught at the meetings of the Illuminating Engineering Society, it will tell the people of Manchester that excessive glare in street lighting is something that ought not to be tolerated; that there is a great difference between the intrinsic brilliancy of a flame arc lamp and the large area mantle of the high-pressure lamp; that therefore the light of the latter is better for the eyes than the light of the former; and that it follows that it is a distinct violation of the principles of pure illuminating engineering to have flame arcs enclosed in plain glass globes only modestly—in fact very modestly—obscured at the bottom. If further it is true to the principles and ideals of illuminating engineering as they have been enunciated from the platform of the Illuminating Engineering Society and in the pages of the "Illuminating Engineer," it will tell the people of Manchester that the eye wants a steady light and not a flickering one; and its Editor will send each member of the City Council a copy of "Light and Illumination: Their Use and Misuse" [*ante*, p. 659]. Information will also be given to the effect that dark shadows under the electric arc lamps, and, where reflectors are used, a well-defined archway of shadow overhead that depresses one considerably, are not good features in street lighting. It will likewise admonish the city councillors to keep quality of illumination in view and not let sympathy for the Electricity Department overcome their judgment as to what represents correct illumination. We shall look forward with interest to the further article on the subject that the "Illuminating Engineer" promises its readers. It ought to be an article full of interest to illuminating experts, from the first word to the last.

It is known that there are prominent electrical engineers who advocate the keeping on their staffs of well-paid men who are clothed in *suaviter in modo*, in order to deal with the complaints of any irate consumers. We know, too, that the diplomatically trained men of the Marylebone Electricity Sales Department are kept for about a month at the end of each quarter trying to pacify discontented consumers—consumers who have a feeling that, in some way or other, they are being "done." Troubles with consumers are considerable in electricity supply; and some of these troubles are produced by the infirmities of electric meters. This is a matter that has been referred to from time to time in the "Memoranda." Now along comes Mr. C. E. Gray, of Ross—a gentleman whose marvellous statement regarding the illuminating power of modern gas-lamps was recently alluded to in our columns. He says there is a point of trouble with the electric meter that has "often" been raised in Ross; and he confesses to some difficulty in finding a satisfactory answer in regard to it, to appease his "often" complaining customers. He feels sure that "many" central station engineers "often" have the same difficulty to overcome. The point refers to meter-rent when the meter has stopped recording, and an average or some other compromise has to be resorted to. The consumer naturally enough objects to pay the so-called "rent" for an article which, clearly enough, has been of no use to either party. That is the point that is "often" worrying. What Mr. Gray suggests in regard to it, in order to get the best side of the complainant, is that the term meter-rent should now abdicate its universal throne and be superseded by the term "service-rent." He thinks a legitimate excuse for the change is that meter-rent embodies rent of service-box, service, and main cut-out. The proposal is a bit unfair, seeing that the meter is the most costly article of the lot.

We have a great esteem—sometimes—for Mr. Alex. C. Cramb, the Electrical Engineer of Croydon. Occasionally the esteem sinks a little when we, unfortunately, get into controversy with him. We see Mr. Cramb has been writing to the "Electrical Review" in defence of the Electricity Publicity Committee. For a long time past, electrical people have been making cutting remarks about the Committee; and since the British Commercial Gas Association has been systematically at work like an excellently running piece of machinery, the comparison thus rendered possible has made the remarks concerning the Electricity Publicity Committee still more caustic. Mr. Cramb's one answer to all the critics is, "Give us the funds, and we will show you what we can do." Bravely said. But he goes on to indirectly declare his belief that no combined effort on the part of the electricity industry is needed, for the gas industry is merely struggling for existence, while the electricity industry—well, that is increasing all the time. Mr. Cramb's exact words are: "The gas interests have been driven to combine by realization that they are fighting for existence; but the electricity supply people, with business increasing all the time, have not the same incentive to combination." Poor gas people! fortunate electric people!! marvellous Cramb!!! Does he not know that in 1882, the total sales of all the statutory gas undertakings of the United Kingdom (excluding all non-statutory concerns) was only 66,613,944,000 cubic feet; while in 1910-11 (the year of the last returns of the Board of Trade) the sale of gas by the statutory undertakings was 182,833,928,000 cubic feet—an increase in the period named of 116,219,984,000 cubic feet, which is getting on for an expansion of 200 per cent. since electricity has been a competitor! Take the decade commencing with 1900-1. The total sales of the statutory gas concerns was then 140,418,454,000 cubic feet; and, as already mentioned, ten years later, the sales amounted to 182,833,928,000 cubic feet—an increase of 42,415,474,000 cubic feet. Have these figures the appearance of a terrible struggle for existence, or do they look like "business increasing all the time?" Note this too, Mr. Cramb. The remarkable increase indicated by the statistics was going on before the advent of the British Commercial Gas Association. Yet the gas industry found sufficient "incentive to combination" in the belief that there is a larger rate of increase to be obtained—apart from any consideration as to meeting defamation of character by envious and mendacious rivals. We are perfectly content that the electricity industry should proceed in its own way; the gas industry in its own way. When Mr. Cramb writes on this subject again, perhaps he will see, with the figures before him that

we have quoted here, cause to tone-down the phrases "driven to combine" and "fighting for existence." We rather think Mr. Cramb is Vice-Chairman of the Electricity Publicity Committee; and in the literature of that body (who is responsible for it at the present time we cannot say) there have been seen various evidences of distortion.

Excellent are the advertising ways of "Tricity." The week before last four Press representatives attended at Tricity House in Oxford Street, saw a joint of meat weighed, ear-marked it, it was carried away to be cooked, and three hours later it was shown to them again, they identified it, it was weighed, and one Press representative was able to declare that in the process of baking it had only lost 1 lb. 1½ oz.; while the "Daily Telegraph" representative was able to assert that it had lost only 12 oz. Of course, somebody must be telling fairy tales. But both papers stated that that estimable old lady Mrs. Beeton asserts that if this joint had been cooked in a gas-oven it would have lost 2½ lbs. Mrs. Beeton had never seen the joint; and perhaps she would have said, had she cut it through after the electrical treatment, that it was underdone. What the modern cook can do in a gas-oven—working at the same temperatures as in the electric-oven and by the baking methods of to-day, and baking to an equal degree—does not appear to be known to the Daily Press representatives who visited Tricity House! And the "Tricity" cooker people took shelter behind the ample skirts of the venerable Mrs. Beeton. The Tricity people have never told the public yet that, if a joint is cooked in a gas-oven at a temperature equal to that of an electric-oven, and if the baking is carried to the same length, it is impossible to do precisely the same in a gas-oven as in an electric oven. Following these newspaper puffs, the issue was advertised of £42,286 of 6 per cent. cumulative preference shares of £1 each in the British Electric Transformer Company—the owners of the "Tricity" cooker. Among other statements in the prospectus is the one that no less than twenty municipal electricity supply authorities have indicated their intention to purchase and let on hire the electric-cookers manufactured by the Company. "Having regard to the magnitude which the hire system in respect of gas-cookers has attained, the adoption of the hire system in connection with electric cooking should prove of marked benefit to the Company." So runs the prospectus, which does not indicate the average sum the municipal corporations are contemplating spending on a hiring-out experiment. Some of the sums we know are not very large.

Funny little stories have been floated from time to time as to the profitable game of supplying cottagers with electric lighting at a fixed price per week. The "profits," investigation has shown, have been microscopic, or a *minus* quantity; and the "illumination"—well, may they be forgiven who so calls it. "Meteor" tells a story about an experience in the Ebbw Vale. He says there is a local housing scheme, and 8d. per week is charged for electric light—7s. 2d. total rental for house and light. For the 8d. each house is "well lighted throughout." But it seems that the tenants are particularly rough people, who indulge in midnight carnivals, get into arrears with the Council, and cause no end of trouble to the collectors. Either from sheer love of illumination, or else in order to "pay" the Council in another sense, they deliberately leave their lamps on all night. The result is that the electrical profit and loss account makes a dismal showing for the suppliers of electrical energy. What else did the Council really expect?

Gas Congress to be Held at San Francisco.

At the Atlantic City meeting of the American Gas Institute, Mr. E. C. Jones, the Chief Engineer of the Gas Department of the Pacific Gas and Electric Company of San Francisco, who attended as a delegate from the Pacific Coast Gas Association, presented an official invitation from the President of the Panama-Pacific Exposition of 1915 to hold a gas congress in San Francisco during that year. The invitation was unanimously accepted, and a Committee was appointed to deal with the matter, as well as to make arrangements for the bringing together of the various Gas Associations into the congress—the ultimate aim being, says the "American Gas Institute News," to "make it historically the most representative of any gathering of men interested in any and all phases of the gas industry throughout the civilized world." The Committee is an influential one; and in view of this fact, and the enthusiasm with which the proposal was greeted, it is believed that the movement will prove a success. The Chairman of the Committee is Mr. Walter R. Addicks, one of the Vice-Presidents of the Consolidated Gas Company of New York and President of the American Gas Institute; and the Secretary is Mr. George G. Ramsdell, Secretary of the American Gas Institute.

At their meeting on Thursday last, Glasgow Corporation agreed to the recommendation of the Gas Committee to subscribe to the fund of the British Commercial Gas Association on the full basis of 2s. 6d. per million cubic feet of gas sold.

The Vertical Gas-Retort Syndicate, Limited, have advice from the Dessau Company to the effect that a repeat order has been received for the erection at the Mannheim Gas-Works of ten beds of eighteen Dessau vertical retorts—an installation of 180 retorts in all.

INTERNATIONAL PHOTOMETRIC CONGRESS.

Proposed Reorganization.

Our American contemporary, "Good Lighting," in its current number, refers to the steps being taken for the reorganization of the International Photometric Commission.

It is pointed out that the Commission—commonly known as the "Zurich Commission"—was created by the International Gas Congress which was convened in Paris in 1900. The Commission, composed of representatives from the various national technical gas societies, with the co-operation of certain of the national laboratories, has been concerned with general questions of photometry in addition to its more specific functions in connection with the photometry of the incandescent mantle. But, inasmuch as there has developed a widespread appreciation of the need of an international, thoroughly representative Commission to deal with general questions of photometry, and possibly also of illumination, it has been proposed that the International Photometric Commission be reorganized to fulfil these requirements in a way acceptable to all photometric interests. This movement is being well received both in Europe and America.

M. Vautier, the President of the International Photometric Commission, has requested the Sub-Committee on "Photometric Units and Standards" to formulate a plan of reorganization. This Sub-Committee was originally appointed at the 1911 session of the International Photometric Commission, to consider the recommendations of the Illuminating Engineering Society of the United States regarding photometric nomenclature and standards. The Sub-Committee is at present composed of the following members: Dr. Brodhun, Dr. Kusminsky, M. Laporte, Mr. Charles C. Paterson (Secretary), M. Th. Vautier, *ex officio*, and a representative of the United States soon to be appointed. The *personnel* of the Sub-Committee, composed as it is of representatives of the various national laboratories, our contemporary points out, is peculiarly qualified to undertake the duty of formulating plans of reorganization; and it is hoped that, as the outcome of the efforts of the Sub-Committee (with the endorsement of the various national technical gas societies to which the International Photometric Commission in the past has been responsible), an essentially new Commission will be formed which will be equally representative of, and responsible to, all national technical gas, electric, and illuminating engineering societies, and other societies interested in photometry and illumination matters.

BELGIAN GAS ASSOCIATION.

[Communicated.]

Belgium, like its neighbour Holland, has for centuries been the cockpit of International warfare; and the successive occupation by its different conquerors has left a mark which affects the whole country to-day, notwithstanding that these brave little countries have been for many years free and independent. For instance, the descendants of pure Flemish stock are as distinguishable, in name, appearance, and speech, as they ever were; while the traces of Spanish occupation are clearly visible, also, in the names and appearance of those in whose veins there runs the blood of Spanish ancestry.

Other signs of military and foreign occupation of the "Low Countries" are also to be found in the names of towns and streets, and in fortified habitations or castles, which are called variously "Château Seigneurial" or "Hôtel." One of the few witnesses of this kind remaining in the very centre of the old town of Brussels is to be found in the remains of the ancient residence of the Duke of Alva (among many others), which is situated at the top of the Montagne de la Cour and is called the "Hôtel Ravenstein," after the bearer of that name, who was Tutor and Regent to Henri le Beau. The parts remaining, although restored, are remarkably interesting, and contain one of the old courtyards, some of the old halls and walls covered with armorial bearings, and several of the old characteristic mediæval fire-places. This old building is the home of modern progress, for in it are the headquarters of that powerful organization the Société Belge des Ingénieurs et Industriels; and in one of the meeting halls of this body there was held, on Dec. 11, a meeting of the Association des Gaziers Belges.

The meeting was one of those informal two-hour conferences which are so characteristic of the gas industry, and which are only possible by reason of the *esprit de corps* which is the rule among gas engineers the world over. The meeting room, a quaint, old place, was rendered more striking by the fact that the walls are covered with the portraits of such giants of modern Belgian industry as Ernest Solvay (of soda fame), Adolph Greiner (the constructional engineer), and Leon de Somzée (the founder of numerous gas-works). The proceedings were presided over by the courteous and amiable M. Pavoux, a Director of one of the numerous gas companies in Brussels (the St. Josse-ten-Noode Company); while the arrangements were carried out by the energetic Secretary, M. Van Heede, the Engineer of the Cie. Continentale du Gaz at Molenbeek-Koekelberg.

In the appropriately ancient surroundings already described, M. Van der Willigen dealt with the ancient history of calorimetry in America, or, in other words, gave a *précis* of a report of the

American Calorimetry Committee which was published in 1908 or 1909; and he described without comment the findings of the Committee. It should be noted that efforts are being made at the present time to establish a universal standard of calorific power throughout Belgium; and this is no doubt the reason why M. Van der Willigen made his communication, which at the present day has only a historical interest, for the American Calorimetry Committee have continued their researches up to date, and have reported as recently as October last. Those who have seen the latest report will be struck by the fact that it is in a sense entirely contradictory ot the earlier report translated and presented by M. Van der Willigen. However, the lack of modernity which had, up to this point, marked the proceedings was supplied by a concise and up-to-date communication or paper read by M. Maurice Koopman.

M. Schindeler, the Engineer at Liege, had during the summer described the Junkers recording calorimeter and Boys calorimeter, &c.; and M. Koopman's paper was in response to an invitation to describe the latest recording calorimeter—viz., Simmance and Abady's—so that the members should be *au fait* with all the different available types. M. Koopman then proceeded to describe this instrument and to discuss the central idea raised by the October, 1912, report of the American Committee on Thermal Values in connection with non-recording calorimeters. It was pointed out by M. Koopman that the later researches of the Committee had left its members dissatisfied with all "flow" calorimeters, on account of their liability, in their opinion, to return misleading and low results in the hands of a biassed or inexpert operator, and also owing to the fact that, under normal atmospheric conditions, all "flow" calorimeters, as at present constructed, return a gross value, which may be considerably less (and can practically never be more) than the true gross or total heat value of the gas. M. Koopman pointed out that the Committee say: "We earnestly recommend to . . . the Bureau of Standards at Washington and others the necessity of devising a calorimeter that will permit of the total heating value of a gas to be determined to a close approximation to accuracy by observations on an instrument that can be used under the same general conditions that now obtain with the use of the present flow calorimeters."

What M. Koopman had to say on this subject was to point out that Simmance and Abady had not been slow to respond to this appeal (scarcely six weeks old); and he described their new arrangement of flow calorimeter (non-recording), in which a thermal and humidity balance between the air supporting combustion and the products of combustion is automatically maintained, so that the total or maximum heat value is always shown, however inexpert the operator may be. A drawing was exhibited showing this arrangement, and figures were adduced to prove how the device prevents the otherwise inevitable loss through humidity differences between the air and the products.

The meeting, which was thus devoted entirely to calorimetry, lasted less than three hours, and terminated with votes of thanks to Messrs. Van der Willigen, Maurice Koopman, and last, but not least, to the Chairman, M. Pavoux.

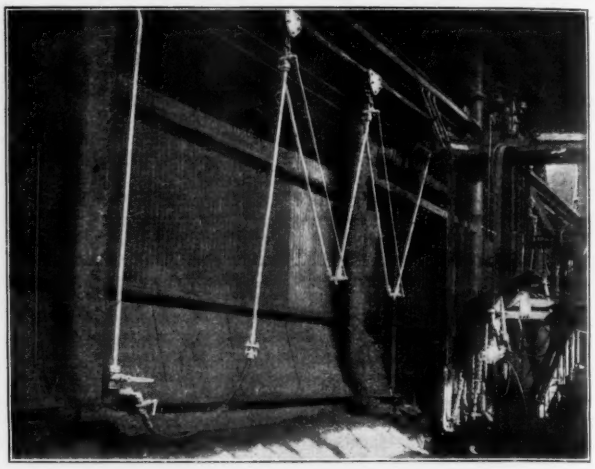
The question of a "Total Heat Calorimeter" is dealt with by Mr. Jacques Abady in an article that we have received from him, and which we propose to publish next week.

WILLIAMS AND M'PHEE'S PATENT ARTICULATED PIPE SYSTEM.

This system comprises an arrangement of pipes and special jointed connections for the conveyance of water under very heavy pressure from a fixed point to hydraulic machines in motion. The accompanying illustrations show the arrangement as in use at the Poplar works of the Commercial Gas Company for driving the retort-house machinery. It has superseded the rubber hose, and has thereby effected very considerable saving, not only in money, but in the avoidance of vexatious delays due to defective hose. Except for an occasional renewal of the packings, there is practically no wear and tear.

The system is suitable for suspension from an overhead beam or wire rope, and is capable of repeated extension and collapse. A series of pipes is employed. The joint between any pair of such pipes comprises a T shaped swivel box or chamber, having one limb adapted to receive a pipe, which may either be capable of rotating therein, and rendered fluid-tight by means of a stuffing-box and screw-gland, or locked against rotation by a set-screw, as shown in fig. 1. The alternative construction indicated in fig. 2, is useful where it is desirable to turn the swivel-box about the axis of the pipe so as to admit of one pipe section being turned relatively to the other.

The other aligned limbs of the swivel-box provide, interiorly, an annular space adapted to receive a hollow and ported plug, formed with an elbow to which one of the second pipes is secured. Each of the aligned limbs of the swivel-box is formed with a stuffing-box into which fits a gland, a shoulder on the elbow abutting against the other gland, so that when the nut is screwed up the packing in both stuffing-boxes is compressed at the same time,



On an extension of the plug is fitted an adjustable rod arranged parallel to the pipe that extends between the two elbow-arms of an adjacent pair of the plugs, so that stresses set up as the pipes are extended are prevented from acting injuriously at the joints. Each swivel-box is formed with an eye by which the alternate ones can be suspended to the monkey-carriage running on the H beam secured to brackets bolted to the columns.

The short lengths of hose could be dispensed with altogether, but are retained for the sake of convenience in handling when connecting to the next hydrant, and as a safeguard in case of negligence.

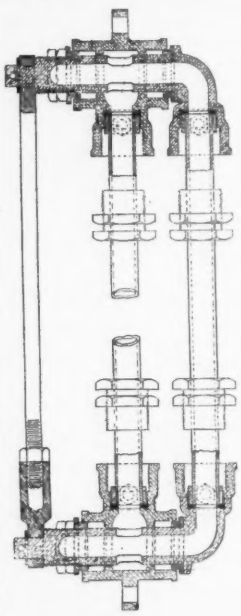


Fig. 1.

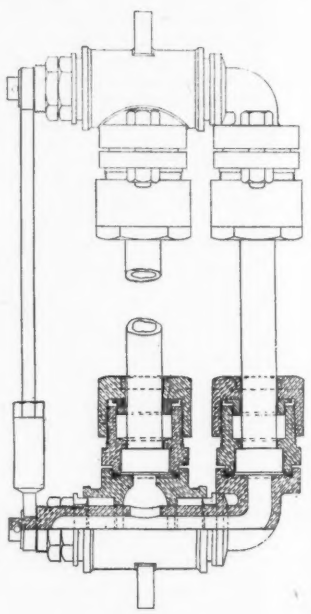


Fig. 2.

The arrangement illustrated is used in place of a 60-foot length of hose. In the case of the retort-house referred to, there are six hydrants; but these might quite conveniently be reduced to three or four, and the number of pipe sections increased. The length of the house is 240 feet. Altogether eight machines are receiving their power in this way.

The system is equally applicable to machines traversing short distances, whose motive power is either steam or compressed air. Messrs. John Russell and Co., Limited, of Walsall, make up these sets so as to meet varying requirements.

Obituary.

The death is reported, as having occurred on the 27th ult., of Herr A. Herzberg, of Berlin—one of the most active German engineers connected with water supply and sewage disposal. He had sat on numerous Commissions, and had been instrumental in founding about ten years ago the German Association for Water Supply and Sewage Disposal.

Mr. Baxter Gray, ex-Provost of the burgh of Broughty Ferry, died last Saturday at his residence "Springbank." He was in his sixty-eighth year, and for nearly a quarter-of-a-century took an active part in the public affairs of the burgh. During this time, he held many important offices, among them being that of Convener of the Gas Committee, and played a prominent part in the negotiations with the Secretary for Scotland relative to the borrowing powers of the Gas Commission.

THE GENERATION AND DISTRIBUTION OF PRODUCER GAS IN SOUTH STAFFORDSHIRE.

At the Ordinary Meeting of the Institution of Civil Engineers last Tuesday, Mr. H. A. Humphrey, M.Inst.C.E., read a paper bearing the above title.

The author remarked that the South Staffordshire Mond Gas (Power and Heating) Company was a pioneer undertaking, since it was the first example of a company giving, under parliamentary powers, a supply of producer gas for public purposes. The advantages of such a supply had now been amply demonstrated; and, in view of the probability of other schemes of a like nature being carried out in the future, precise information and data should prove of interest to members of the Institution. The Company's Act contained clauses prohibiting the sale of gas for domestic purposes or for illumination; and the limit of carbon monoxide in the gas was fixed at a maximum of 14 per cent.

The area of supply comprised 123 square miles, within which there were six corporations, sixteen urban district councils, and three rural district councils. For the central station, an area of about 40 acres of land, adjacent to railway and canal, was secured at Dudley Port, Tipton, which was practically the centre of gravity of the whole area. The designs of the central station plant and buildings and the distribution system were carried out by the author, as Consulting Engineer to the Company; and the contract for the whole of the work was let to the Power Gas Corporation, Limited.

Generating-Station.

The unit of plant adopted was based on a capacity for gasifying 140 tons of coal per day, and consisted of eight Mond gas producers, together with the necessary gas-cooling, cleaning, and compressing plant; plant for the recovery of sulphate of ammonia and tar; and the machinery, comprising steam-boilers, circulating-pumps, electric generating-plant, motors, fans, &c. The first unit erected was started in operation in February, 1905; and at the present time additions were being made which would increase the output by about 80 per cent.

Plant furnishing a public supply of gas had to run day and night all the year round without any stoppages; and in describing in detail the parts of the plant, the author mentioned the various arrangements adopted to ensure such a continuous supply. The first supply to the public was commenced in May, 1905; and up to the present there had not been a single stoppage of the gas supply from the station—the pressure being maintained in the trunk mains throughout the whole period.

The steam-boilers were adapted to be either coal or gas fired, or to be fired simultaneously by both means. The blowers were steam driven; and as there was no storage-capacity for gas, the speed of the blowers had to be varied in order to keep pace with the demand.

Of the eight Mond producers one was a spare one. Each producer was rated at 20 tons of coal per twenty-four hours; but in meeting the peak of the load, the producers had been worked at 50 per cent. above their rated capacity. The gas from the producers passed through a mechanical washer, for removing the dust and for cooling and saturating the gas, and then through an acid-tower, in which a counter-current of acid liquor absorbed the ammonia from the gas; so that when the liquor was subsequently evaporated, solid sulphate of ammonia was obtained. The gas then passed through cooling towers, in the first of which hot water was obtained, and was used for heating and saturating the blast during the passage of the water through an air-heating tower.

The author then described the various water-circulating systems, and also the further means of cleaning the gas before it left the plant.

The gas was measured through rotary meters; and the Act authorized the use of such meters in the sale of gas to customers. The clean measured gas passed to the gas-compressors, which were of the Riedler type, and were steam driven. Each compressor was capable of compressing 9400 cubic feet of gas per minute up to a pressure of 10 lbs. per square inch, which required 430 I.H.P. The initial pressure chosen for distributing the gas was 7 lbs. per square inch; but only 5 lbs. per square inch was required at present, since the trunk mains were not working to their full capacity. All the exhaust steam from the gas-compressors, pumps, and other steam-driven machinery was utilized in heating and saturating the producer blast. There were a number of electric-motors for driving different sections of the plant; and the current for these and for lighting the works was obtained from Westinghouse gas-engines.

The periods for cleaning the different parts of the plant were given, and showed that the majority of the machinery ran about six weeks continuously day and night before being stopped for examination. The acid-towers ran for two years continuously; and in the seven years of operation, it had not been necessary to change over the gas-cooling and air-heating towers.

The author next described the methods of preparing the sulphate of ammonia and tar for sale.

The control of the pressures throughout the plant, and the safety-devices employed, were then dealt with. The three points at which automatic control had been introduced were: (1) At the blowers, to maintain a constant *plus* pressure on the inlet to the purification-fans; (2) at a bye-pass between the delivery and suction sides of the compressors, to prevent the formation of a vacuum on the suction side; (3) at the compressors, by utilizing a pressure governor so that the speed of the compressors is maintained to keep constant the gas pressure in the delivery mains.

Operating Records and Other Data.

Typical analyses of the fuel used were given by the author, and the methods of handling the fuel and ashes described. Curves had been plotted showing the coal gasified, the sulphate of ammonia made, and the tar sold per month for the thirty months from January, 1910, to June, 1912. Other curves gave the total gas made and sold for a period of eighteen months; and in order to indicate the fluctuations of the gas supply from hour to hour, the meter-readings at the central station were plotted in the form of a curve covering a period of one week. At the peak of the load, an output of 1 million cubic feet per hour had now been attained; and the plant, which was designed for gasifying 140 tons per day, had reached the rate of 200 tons per day. Curves indicating the principal temperatures and pressures throughout the plant had been plotted, and tables showing the calorific value of the gas over long and short periods were given. The Mond producer gas distributed averaged over 150 B.Th.U. per cubic foot, and the regularity of the calorific value was remarkable.

Distribution of Gas.

Owing to the fact that considerable portions of the area of supply were subject to subsidence—due to the presence of disused coal mines, and for other reasons, such as cost, number of joints, &c.—steel mains were adopted in preference to cast iron. The author mentioned his experience on this subject. Special attention was paid to the coating of the steel mains laid underground, to prevent attack due to the acid water which is prevalent in the district. All mains between 36 inches and 21 inches in diameter, inclusive, were of the locking-bar type, particulars of which, and of the method of jointing, were given. For the smaller mains, welded steel pipes with screwed joints were employed. Up to September, 1912, there were laid 22,666 yards of locking-bar pipes with lead joints, and 29,181 yards of steel pipes with screwed joints—making a total of 29·45 miles. Additional mains were now being laid.

Calculations for the Flow of the Gas.

The method of calculating the size of mains required and the formulæ used were set out in an appendix, and an account was given of some important experiments carried out by the author to ascertain the loss by friction in a long length of trunk mains. For this purpose, the trunk main between the central station and Bilston, consisting of 10,254 yards of pipes ranging in size from 36 inches to 27 inches in diameter, was used; and air was blown through these pipes in varying quantities and at various pressures. The results obtained were given in tabular form, and showed the extent to which the presence of a large number of branches, crosses, valves, and other specials served to increase the frictional losses. Plans of all the mains laid up to date were given, and the more important features of the distribution system discussed.

Uses of the Gas.

The gas supplied to consumers was used for two purposes—namely, for the production of power in gas-engines, and for various forms of heating in furnaces, &c. There are at present over 150 gas-engines connected with the Company's mains; and it is a significant fact that practically every suction producer situated near the mains has been shut down—the owner having found it more advantageous to take a supply from the Mond-gas mains. From this cause forty-five gas-producer plants had been thrown idle—twenty being suction plants, and twenty-five pressure producer plants.

A schedule of prices under which gas was supplied was given in an appendix—the price varying, according to the quantity taken, from 1¼d. to 2¾d.; and the present costs of production and distribution of the gas were compared with the estimates given when the Bill was before Parliament. These figures showed that the estimated costs of production, based on a much larger plant, had been practically realized in connection with the first unit installed.

The average price received from consumers was, at June, 1912, about 1·75d. per 1000 cubic feet. This was equivalent, having regard to its calorific value, to lighting gas at 7d. per 1000 cubic feet. So that the benefits derived by the consumers were obvious. They were further illustrated by some actual examples of saving due to the use of the gas.

A list of the heating operations for which the gas was employed was given; and additional uses for it were constantly being found. Temperatures up to 1600° C. were being regularly maintained, and the use of gas for heating operations had proved very satisfactory; the constancy in the calorific value of it enabling results to be repeated with certainty. Also, there being no stand-by losses and no fuel and ashes to be dealt with, there was realized additional economy and cleanliness.

It was probable that the success which has attended the supply of a cheap fuel gas in South Staffordshire will direct attention to this important subject, and will serve to demonstrate the advantages which could be derived by other industrial areas from a similar supply. The subject has already been removed from the

experimental stage, and the safety and convenience of such a supply has been amply proved.

For the year 1911, there was a gross trading profit of £8856; and it was expected that when the new plant, now in course of erection, was brought into use, the financial results would be greatly improved.

NOTES ON THE COMBUSTION OF FUEL.

[Communicated.]

The quantity of coke used for retort-bench producers has now-a-days been reduced to so fine a figure that the gas engineer who would be anywhere in the running has continually to be facing the question as to the most economical means of using his fuel. Not only, too, have the retort-house requirements to be considered; but on nearly all gas-works there are other more or less subsidiary demands (such as boilers) which all help to increase the total fuel account.

The chief point to be considered, then, is the best means for abstracting the maximum quantity of heat—that is, the highest proportion of the calorific value from the fuel—and the utilization of this heat with a minimum loss. On gas-works, of course, the two fuels used almost without exception are coke for the retort-bench producers and either coke or breeze—or a mixture of both—for steam-raising purposes.

The employment of tar for boiler-firing need not be considered here; for the price it is now commanding has rendered its use unprofitable, though some few years ago it became quite popular. The price at that time was only about 1d. per gallon; and, in order that tar may compete with coke, its price must not be greater than about 1½ per gallon. This can be shown by comparing the relative calorific values of the two fuels, or the number of B.Th.U. obtained per penny from each. With coke at 17s. 6d. per ton, there would be a yield of about 140,000 B.Th.U.; whereas tar at its present price would give about 80,000 B.Th.U. for a penny. Moreover, practical difficulties, such as intense local heat, have been rather a set-back to the more general employment of tar.

Fuel and Heat Losses.

In connection with the firing of producers and boilers, heat losses are continuously taking place; and the efficiency of the firing depends very largely on the extent to which the avoidable losses are minimized. It is, perhaps, scarcely realized what an expense inefficient firing may involve. For instance, if the fuel loss only amounts to as little as 5 per cent., this will entail a loss of between £30 and £40 per retort-setting per annum. With a bench of twenty beds or more, the loss is somewhat considerable. In most cases the following remarks will be found to apply to both boilers and retort-bench producers, and the principal losses may be summarized as follows:—

1. Incomplete combustion of carbon to carbon monoxide.
2. Incomplete combustion of carbon monoxide to carbon dioxide.
3. Fuel falling through fire-bars into ash-pit, or removed with clinker.
4. Losses due to radiation.
5. Loss of heat in waste gases.
6. Too rapid velocity of draught.

With regard to the first two, these are perfectly avoidable, of course, providing that the producer is correctly designed; and, resulting from an insufficiency of primary or secondary air, they are best remedied by systematically analyzing the waste and producer gases. If the design of the producer is at fault, the trouble is more serious; and the possibilities are that insufficient grate-area has been allowed. With the modern producer, the rule allotting one square foot for each lineal foot of retort is most reliable; although in the case of settings with two furnaces, this amount should be slightly increased. For an ordinary setting of ten retorts, this would allow a grate-area of 20 square feet; and the producer should be built as square as possible. It is far better to have a producer on the large side rather than being too small; for there will be less tendency for the air to "slip" up the sides of the furnace, a shallower bed of clinker will be formed, and the primary air will be in contact with the hot coke for a longer period.

In the case of boiler furnaces, incomplete combustion may be the result of an inadequate air supply above the fuel.

Maximum Combustion Temperature.

The evil of admitting an excessive quantity of air should, perhaps, be mentioned here; for it must be borne in mind that the highest temperature which can be attained by the combustion of fuel is the temperature to which the products are raised by the heat evolved in their formation. Thus, the greater the volume of gases which have to be heated, the less will the temperature be.. It is in this respect that regeneration makes so great a difference; for, when the air is heated before combustion is allowed to take place, the heat in the air is added to the heat of combustion. Thus the quantity of heat available for raising the temperature of the products is very much greater.

It is advisable to avoid, as far as possible, filling up furnaces with coke which is only partly carbonized—that is, if the retort charges are "green," their discharging into the furnace should be postponed. The effect of a sticky fuel is to restrict the primary air supply by stopping-up the interstices between the particles of coke; and irregular combustion is the result. Moreover, a certain amount of heat is absorbed in driving off the volatile constitu ents remaining in the coke, although these constituents themselves are combustible.

As regards radiation losses, these have now been very greatly reduced by constructing the secondary air flue alongside the producer, and also by means of various non-conducting materials which are being made use of either just in front of or just behind the outside walls of the setting. It must be remembered, however, that it is not profitable to deprive the producer of heat in order to warm up the secondary air; and so the former should be insulated as far as possible, leaving the waste gases to do most of the secondary air heating.

The loss of heat owing to the velocity of draught being too high is one which is not always taken into account. The loss takes places in two ways: Firstly, the rate of travel of the air through the fuel-bed may be sufficiently slow for the formation of carbon dioxide; but the time of contact may not be sufficiently long for the reduction of the carbon dioxide to monoxide. Secondly, the waste products may be drawn through the setting at such a rate that the maximum quantity of heat is not given up to the regenerating flues.

Flue and Chimney Area.

It is in the above respect that chimney height and flue area are important; and both should be designed with care. For flue area, the usual rule for retort-settings is to allow 1½ square inches per lineal foot of retort in the whole bench which is dependent on the flue. The actual height of the chimney is usually settled by practical experience; but it is interesting here to recall the theory of shafts.

Natural draught depends for its action on the difference of density between the warm products of combustion and the cold air outside. Moreover, the quantity of gas drawn up by a chimney increases in proportion to the square root of the height. Thus any increase in height produces only a comparatively small change in the quantity of gases carried off by it. As a matter of fact, a chimney will give its best draught when the temperature of the gases it carries differs from the atmospheric temperature by 273° C. In consequence, when the difference between the two temperatures is greater than this, the draught is not so good, and a greater and unnecessary loss of heat takes place. The heat of the escaping gases must not, however, be looked upon as all loss; for a certain temperature is necessary for the creation of a natural draught.

It is occasionally noticed that analyses of waste gases show the presence of carbon monoxide, and, in addition, a quantity of oxygen more than sufficient for the combustion of the former. This is entirely due to imperfect admixture of the gases, and seldom takes place in the more scientifically designed furnaces or boiler flues.

It is rather a matter for regret that the practice of periodically drawing-up heat-balance charts is not more generally carried out on gas-works; for it is only in this way that a true check can be kept on fuel consumption, and quite unlooked-for extravagances are thereby very frequently indicated. It is, of course, a difficult matter to obtain the heat-balance of a retort-setting, owing to the impracticability of estimating the amount of heat required for the carbonization of the coal.

New England Association of Gas Engineers.—We have received the volume of proceedings of this Association for the years 1911 and 1912. It contains the papers submitted at the forty-first and forty-second annual meetings, held at Boston (Mass.) under the presidency respectively of Mr. W. H. Snow and Mr. John A. Coffin, whose portraits are given as frontispieces. The volume contains an interesting collection of papers, several of which have been given in the "Journal," and they are illustrated in the text and by folding plates. The description of the new gas-works at Providence (R.I.), given at the earlier meeting by the President of Gas Company (Mr. J. W. Ellis), was a specially valuable contribution. The technical matter is preceded by a table of contents; and at the end of the book will be found a list of the Presidents and Secretaries of the Association, and of the present officers and members.

Large Humphrey Pumps.—In the last number of the "Journal" it was announced that his Majesty the King would open the new reservoir of the Metropolitan Water Board at Chingford. It may be remembered that there will be a very fine installation of Humphrey pumps there, put up under the supervision of the Chief Engineer of the Board, Mr. W. B. Bryan, M.Inst.C.E. There will be five in all, four of them having a capacity of 40 million and one of 20 million gallons—a total output of 180 million gallons—a day; the lift being from 25 to 30 feet. Some even larger pumps have been designed by the Pump and Power Company, of Westminster, for the consideration of the Public Works Department of the Egyptian Government; one being equal to delivering no less than 100 million gallons per day, with a lift of 19 feet. These pumps, which have already been described in the "Journal," are illustrated in the current number of "Engineering."

THE GLOVER-WEST VERTICALS AT NELSON.

Inauguration of the Installation.

The formal inauguration of the new carbonizing plant at the Central Gas-Works of the Nelson Corporation, on Monday of last week, was made the occasion of a pleasant and interesting function. Not only were neighbouring authorities represented at the gathering, but about seventy gas officials—the majority engineers and managers of Lancashire and Yorkshire undertakings—had accepted invitations to be present. Early on in the afternoon, the visitors were welcomed in the Gas Offices by Mr. C. Townsley, the Chairman of the Gas Committee; and subsequently a move was made towards the new retort-house, a description of which, and the new plant it contains, appeared in last week's issue (p. 822-4), together with other details of the gas undertaking.

The MAYOR (Mr. W. E. Riley) said the opening ceremony that day was of great importance, not only to the residents of Nelson, but to the outlying districts, as a large number of consumers would be affected by the introduction of their modern gas plant. For some time, the Gas Committee had felt that their old plant was altogether inadequate for the requirements of the borough; but it was not until after the fullest consideration and inquiry into various systems of carbonization that the Sub-Committee, to whom the matter was referred, issued their report. After detailing the reasons which induced the Committee to adopt the Glover-West vertical retort system he said that along with their Engineer (Mr. A. Morton Fyffe), the Chairman of the Gas Committee had devoted himself heart and soul to the question of the new gas plant. He might add that Mr. Townsley had, in his work as Chairman, brought to bear those qualities which had won him conspicuous success in other spheres. It was, therefore, no new thing for him to receive tokens of approval; but he (the Mayor) thought that, at any rate, it would be a new experience to receive from a gratified town a gold key in token of his successes as Chairman of the Gas Committee. He hoped that the token would always bring him pleasant recollections, not only of his labour in connection with the Nelson Gas Department, but of his whole work for the Corporation.

Mr. TOWNSLEY, in returning thanks for the presentation, said his Committee were particularly thankful that the extensions to the works had been carried out without loss of life or limb. This fact must have been a source of great satisfaction, not only to the Contractors, who had done their work so well, but to their own Engineer. Mr. Fyffe had certainly given them of his best; for in addition to getting out the particulars for the foundations, he had drawn the plans for the new building, and had almost lived on the job for the last twelve months. In their Engineer, he thought they had a man who was thoroughly capable of discharging the work entrusted to him; and he was sure he was safe in saying that Mr. Fyffe enjoyed the full confidence not only of the Gas Committee, but of the whole Council.

Subsequently the visitors were entertained at tea in the Council Chamber at the Town Hall; the chair being occupied by Mr. TOWNSLEY. After the repast,

Alderman EMMOTT, of Burnley, gave the toast of "The Borough of Nelson." He said he had been more than interested in the new plant he had seen that day at Nelson, because at Burnley they were also interested in the vertical retort question. They had had the matter in hand for some considerable time at Burnley; but they met with more opposition than he could hear they did in Nelson. However, he thought the vertical retort was the system of the future. In Burnley, vertical retorts had been in operation for the last three or four years; but unfortunately they had not reached their goal. With the present pitch of success, however, that the vertical system had attained, he (Alderman Emmott) anticipated that before long Burnley would be similarly equipped. He understood Nelson was doing very well out of its Gas Department; and he offered his hearty congratulations to the Chairman thereon. In one respect Nelson was certainly ahead of Burnley, and that was in respect of the lighting of its back streets. Their attention was continually being drawn to Nelson's superiority in this respect. Alluding to the comparative merits of gas and electricity for street-lighting, he said that in his opinion there was nothing superior to incandescent gas for all kinds of streets. It was important that gas authorities should give attention to the question of illuminating "slum" property in old townships.

The MAYOR OF NELSON, who responded, said that during the 22 years the town had been incorporated, its record had been one of continual progress; and the ratepayers of the present day were reaping the benefits of the intelligent foresight of those who looked ahead and anticipated the development of the town.

Alderman SHAW (the Chairman of the Finance Committee), who proposed the toast of "Neighbouring Boroughs," alluded to the friendly terms they were on with adjacent authorities. He said he was an admirer of Burnley for many things; but there was one dark spot—the inferior lighting of the back streets, which had been referred to by another speaker. It had been claimed for Nelson that they were ahead of their neighbour in this respect; but the Gas Committee considered the lighting of back streets, courts, and alleys to be essential. He hoped Burnley would not long be behind in this matter.

Alderman FOULDS (Colne), in responding, congratulated Nelson on possessing an up-to-date vertical retort installation—a gas plant which had practically revolutionized gas making. He had been so impressed with what he had seen that afternoon, that he had told their Engineer they would have to get a similar installation at Colne. Municipalities should progress with the times. He would even go so far as to say that, if they discovered something which was better than gas, they should let the people have it, if they wanted it.

Alderman DYSON (Deputy-Mayor of Nelson), in proposing the toast of "The Nelson Gas Committee," said the gentlemen who constituted the Gas Committee were men of "light and leading," presided over by a Chairman who took a deep interest in the work, and backed up by a Gas Engineer who was a credit to the profession. He thought Nelson possessed one of the most up-to-date works in the country. Credit for this was due to Mr. Townsley and Mr. Morton Fyffe.

Mr. TOWNSLEY, in acknowledging the compliment, said his first duty was to express his pleasure at seeing such a distinguished company that afternoon. He assured them that he appreciated their presence. After narrating how the Gas Committee decided eighteen months ago that the carbonizing plant at the central works should be superseded by modern plant of increased capacity, he went on to say that he well remembered attending, along with their Engineer, the Glasgow meeting of the Gas Institution, at which they had the pleasure of hearing papers read by several distinguished gentlemen on the subject of vertical retorts. At that conference—which was a most profitable one in every way—the chief subject was the question of vertical retorts, and both he and their Engineer had an opportunity of speaking privately to such gentlemen as Mr. Newbigging, of Manchester, Mr. Allen, of Liverpool, Mr. Glover, of St. Helens, and Mr. Bond, of Southport. "I should like to say," he went on, "that at the Glasgow conference I was greatly impressed by the kindly and cordial manner in which we were then treated. Another matter that greatly impressed me was the willingness of the members of the Institution to freely exchange ideas with one—showing how valuable and necessary conferences are." It was, he went on, immediately following the Glasgow conference that a Sub-Committee was formed to thoroughly investigate the matter; and they ultimately visited several of the finest and most up-to-date gas-works in Lancashire and Yorkshire. When the Sub-Committee finished their duties, they had no hesitation in recommending that the Glover-West system was the best for their requirements. This recommendation was subsequently confirmed by a full Committee; but he could assure them that this decision was not arrived at without the most careful consideration. In fact, the full Committee went to St. Helens to see the vertical retorts at work there. They also sent 100 tons of coal from a local colliery to St. Helens, and Mr. Fyffe went over there and worked it. The results he obtained gave the Committee the confidence which resulted in the installation they had inspected that afternoon. In the descriptive booklet they had all received, it was remarked that as the installation had been in operation less than two months no working results had been given; but it could be confidently stated that all expectations had been fully realized, and the plant was in every way satisfactory. This was true to-day. It was something to know that since the installation had been completed it had been inspected by engineers from Boston (U.S.A.), Gothenburg, Berlin, and Paris. He believed that in three of these cases the visitors had been so impressed with what they had seen at Nelson that orders for installations on similar lines had been received by the manufacturers. While those present were partaking of a repast in the Council Chamber, the workmen were not forgotten, and were being entertained at the works that night.

Mr. DIMSDALE (a Labour member of the Gas Committee), in proposing "The Visitors," said he was delighted to welcome so many engineers from neighbouring towns. A most important point in any local government, and especially in gas-works administration, was that to ensure success there must be complete confidence and good fellowship between the Committee on the one hand and the officials and workmen on the other. He could assure them that the best of feeling existed in Nelson between the public representatives and the Corporation employees.

Mr. JOHN BOND (of Southport), who responded, said that every visitor to the Nelson works that day must have been impressed with the great amount of work which was carried on there. They well understood that the work was of an arduous nature, and great credit was reflected upon the Engineer in bringing everything to a successful conclusion. Mr. Fyffe was backed up by a Chairman who had heart and soul in the work; and he was equally sure he was supported by the whole of the Gas Committee. The Nelson Corporation had done the right thing in having one of the finest installations of vertical retorts that the world could produce. It was an installation on which science had been brought to bear by their esteemed friend Mr. Glover, and also by Mr. John West, who, he was sorry to say, was, through illness, not with them that day. It was the object of every gas engineer of the present age to make gas as cheaply as it was possible to do; and not only to make it cheaply, but to sell it cheaply, because gas was the only weapon with which they could successfully fight the smoke nuisance. Any corporation-owned gas undertaking should, he thought, be very careful not to dip too deeply into the gas estate profits in relieving the rates. He looked forward to the time when gas would be sold at something like 1d. per 100 cubic feet. Cheap gas, and the blessings it brought in its train, were, in his opinion, of as much importance to the health of the community as (say) the sewage schemes about which they heard so much.

Alderman RICKARD (a member of the Gas Committee), who proposed "The New Works," said that to his mind this was the toast of the evening. He was glad to tell them that in Nelson they had a Gas Committee who were anything but old-fashioned; they believed in moving forward with the times. Had they reached the "last word" in vertical retorts? Was it the last word in gas making? He ventured to say that those responsible for the Glover-West retort were not so egotistical as to claim this. He thought after full consideration of the new installation they had seen that day, they would discoverth at the fundamental principles of gas making still remained. What the Glover-West system had accomplished was to improve the methods of gas making, and to economize in every way what formerly had been lost in the process. With the toast he coupled the name of their Engineer (Mr. Fyffe), and predicted for the Nelson gas undertaking a great future. Profits would be larger than in the past; and the ratepayers would benefit from the increased consumption and improved quality of gas through the installation of the new plant.

Mr. MORTON FYFFE, on rising to respond, was received with much enthusiasm. After a reference to the very cordial relationship which existed between the members of the Gas Committee and himself, and paying a high compliment to the Contractors and their workmen for the manner the work had been carried out, he said he was satisfied

Nelson now possessed a first-class plant; and he thoroughly believed that the vertical retort system was the best for carbonization.

Alderman EASTWOOD, in proposing the toast of "The Profession of Gas Engineers," said a present-day gas engineer had to be educated in a variety of subjects. He had not only to have a knowledge of engineering and works methods, but had to understand the philosophy of mechanics, hydrostatics, and other important matters—a very high plane of knowledge. He was glad to see that the names of the two gentlemen who were associated with the toast—Mr. Samuel Glover and Mr. Charles Wood—represented two important departments of the gas engineering profession. Mr. Glover was a member of the Institution of Civil Engineers, and Mr. Wood was a Fellow of the Chemical Society; and, as they all knew, chemistry was vitally allied to the question of the production of gas. One of the speakers had asked whether the "last word" had been said in gas manufacture, and whether they had reached perfection. Personally, he was not such an optimist as to believe they had reached this stage. Mr. Glover, he was sure, would agree with him that they had made a great forward step, and that there were fields to conquer which offered even a more brilliant future for the profession.

Mr. SAMUEL GLOVER, who was received with applause, said the alliance of mechanical engineering and chemical engineering had been alluded to as part of a gas manager's education. He only proposed to deal with the mechanical and commercial aspect. He had been glad to visit Nelson that day, because he had found another sympathetic municipal body, who were ruling, guiding, and counselling the Gas Department in an intelligent and helpful manner—an important consideration to the engineer who was entrusted with the management of the gas estate. He claimed for the gas engineer of any town that—to do his work properly—he needed the sympathetic help and confidence of the municipal body or company whom he served. If the engineer did not get this, he was not sufficiently strong to carry out his ideas, and perfect them as he ought to do; and, if he had not the sympathy of the Committee, he felt isolated. [Hear, hear.] There was only one gas engineer in most towns; and if that engineer was not allowed to travel—after he had completed his education in other directions—he began to fall behind He was delighted to find the Nelson Gas Committee gave their Engineer the most cordial support in this matter, and that he was allowed to go out into the world to see any new inventions. The Nelson Town Council appreciated the difficulties of a gas engineer, and realized that it was no use for him to continually remain at home, but sent him out into the world to reap the benefit of the latest inventions. A gas manager of to-day had to be on the alert from beginning to end. He had to purchase the materials from which he made his gas, and he had to make gas 365 days out of the year. He had also to make gas for every 24 hours of the day; and when some of those present realized, as they had done that afternoon for the first time, that retorts had to be kept at a proper temperature every hour of the day, so that the process of gas making went on in a proper manner, they understood in some measure the arduous duties a gas engineer had to perform. He had to have the ability to erect, select, and work apparatus of all sorts—especially where the engineer was in charge of a works in which bye-products played an important part. He (Mr. Glover) claimed for all gas engineers of to-day sympathy, help, and confidence in the work they had to perform. He was glad to find that committees were now interpreting the duties of a gas engineer in a broader sense than they had done before. It was no longer considered sufficient that gas engineers should keep up the price of gas in order to make big profits, but they realized that the gas engineer performed an important vocation in looking after the interests of the community at large by discovering the best methods of producing gas and the best means of using it. He had been honoured by his Committee at St. Helens with their confidence. St. Helens was, nowadays, the Mecca of gas engineers on several matters of importance to the profession. During the last four or five years, he had had the opportunity of studying the calibre of the men who were leading in the profession to-day; and he assured them that it was very high. Speaking of the vertical retort system with which his name was associated, he said he was sure a step had been taken in the right direction, and that they had now got retorts at the right—or proper—angle. They did not assert that the "last word" had been said in vertical retort construction; but he hoped, by maintaining their superiority, to hold and to develop the position they had attained. He confessed that one of the hardest nuts he had had to crack was the Engineer from Nelson—who had most of the qualities and the abilities of the North Britisher. All his (Mr. Glover's) statements to him were accepted with a very great amount of reserve. In conclusion, he said that, as gas engineers, they had to thank gas committees generally for their appreciation of their duties, and, in particular, he wished to thank those present for their support of Mr. Fyffe.

Mr. CHARLES WOOD (of Bradford) said he could endorse every word Mr. Glover and Alderman Eastwood had said about the duties of gas engineers. Speaking generally, he was glad to state that the gas engineers of to-day had the full confidence of their committees and boards of directors. As an illustration of this, he might say that when they, in Bradford, were considering the question of installing vertical or other kinds of retorts, he had the opportunity of visiting practically all the important installations of vertical retorts, not only in England, but on the Continent. It was only after a thorough investigation of the different types of retorts, that his Committee, on his recommendation, decided to adopt the Glover-West system, though there were then only two Glover-West installations at work. Referring to the future of gas engineering he said that he did not believe they were anywhere near finality in gas manufacturing. There had been more progress in gas engineering during the last six or seven years than in most professions. He was sure that in Nelson they would quickly appreciate the benefits which would follow their adoption of the Glover-West system.

Alderman DAVIES (a member of the Gas Committee) proposed "The Contractors;" alluding to the excellent way in which the work had been carried out. He agreed with all Alderman Rickard had said.

Mr. FRED. J. WEST (of West's Gas Improvement Company) responded, and thanked those present for their appreciative words.

An eloquent tribute to the Technical Press, by Mr. H. E. BLOOR, of Carlisle, terminated the proceedings.

INSTITUTION OF WATER ENGINEERS.

THE Seventeenth Winter Meeting of the Institution was held on Saturday, at the rooms of the Geological Society, at Burlington House, W., under the presidency of Mr. J. S. PICKERING, M.Inst.C.E., of Cheltenham.

GENERAL BUSINESS.

The SECRETARY (Mr. Percy Griffith) read the minutes of the summer general meeting, which was held at Cheltenham; and they were confirmed.

On the nomination of the PRESIDENT, Mr. R. B. Rigby and Mr. A. Towler were appointed Scrutineers of the ballot papers.

The PRESIDENT proposed, and Mr. C. CLEMESHA SMITH seconded, the appointment of Messrs. Wood, Drew, and Co. as Auditors, and as Honorary Auditors Mr. E. Brough Taylor and Mr. Sidney R. Lowcock.

PAPERS AND DISCUSSION.

There were only two papers read; and they were discussed together. The first was by Dr. ADOLPH KEMNA, on "Recent Advances in the Science of Water Purification." The second was by Dr. J. C. THRESH, on "Some Recent Examples of Pollution of Public Water Supplies." Extracts from these papers, with points from the discussion, will be given in a succeeding issue of the "JOURNAL." There was a third paper on the *agenda*, by Mr. E. J. SILCOCK, M.Inst.C.E., the subject being "The Valuation of Water Undertakings on Transfer to Local Authorities." Owing to the considerable time occupied by the discussion on the papers of Drs. Kemna and Thresh, it was thought advisable, in view of the importance of the subject treated by Mr. Silcock, to postpone both the paper and discussion until the next meeting.

OFFICE BEARERS.

The Scrutineers reported that the following gentlemen had been appointed to hold office during the next Institution year:

President: Mr. C. Clemesha Smith, of Wakefield.

Vice-Presidents: Mr. Thomas Molyneux, of Stockport; and Mr. F. W. M'Cullough, of Belfast.

Ordinary Members of Council: Mr. F. J. Bancroft, of Barnet; Mr. A. B. E. Blackburn, of Sunderland; Mr. S. C. Chapman, of Torquay; Mr. William Matthews, of Westminster; Mr. Henry Preston, of Grantham; Mr. C. H. Priestley, of Cardiff; Mr. H. W. Woodall, of Bournemouth; Mr. R. H. Wyrill, of Swansea; Mr. F. J. Dixon, of Ashton-under-Lyne; and Mr. F. W. Davies, of Nottingham.

ADDITIONS TO THE MEMBERSHIP ROLL.

The roll of membership was extended by the addition of the following names:

Members: Mr. T. H. Chapman, of Colombo; Mr. H. R. Crabb, of Pembroke Dock; Mr. W. Fiddian, of Stourbridge; Mr. C. P. Hogg, of Glasgow; and Mr. Victor van der Taelen, of Antwerp.

Associate Members: Mr. W. H. Cooper, of Aberdeen; Mr. C. G. Cotton, of Autofagasta; Mr. G. T. Edwards, of Bamford; Mr. E. D. Groves, of St. Austell; Mr. R. C. Moon, of Nuneaton; Mr. G. H. Phillott, of Cheltenham; Mr. W. Ridler, of Tewkesbury; and Mr. H. Tong, of Bolton.

Associates: Mr. D. Dinwiddy, of London; Mr. A. W. Oke, of Brighton.

Transfers from Associate-Members to Members: Mr. J. A. Hutchinson, Mr. J. W. Wilkinson, Mr. F. H. Brunt, and Mr. C. H. H. Adams.

INVITATION TO WAKEFIELD.

Mr. C. CLEMESHA SMITH said he should like to thank the members for the honour they had done him in electing him President of the Institution. He was conscious that he was lacking in many of the qualities possessed by those who had gone before him in the chair, and which raised the Institution to the position it occupied among kindred societies. However, he felt sure he should have the support of the Past-Presidents, of the Council, and of the members generally; and, with this support, he himself would do the best to maintain the dignity and usefulness of the Institution. He had been asked by his Worship the Mayor of Wakefield to invite the Institution to visit their industrial centre next year. He hoped the visit would be one of interest to the members; and he could promise them a very hearty Yorkshire welcome. [Applause.]

VOTES OF THANKS.

Thanks were duly tendered to the Council of the Geological Society for the use of their apartments, to the Scrutineers, and to the authors of the papers.

Thorium and its Compounds.—In the "JOURNAL" for the 5th ult. (p. 443), an epitome was given of a lecture on the above subject by Mr. Edmund White, B.Sc., F.I.C., before the Institute of Chemistry. The lecture has now been printed in pamphlet form, and a copy has been sent to us by the Registrar and Secretary (Mr. R. B. Pilcher). It is published at the offices of the Institute, 30, Bloomsbury Square, W.C., at the price of 2s. net to those who are not connected with the Institute.

STRESSES IN A SIMPLE ROOF-TRUSS.

By J. Harger Pye, of Clevedon.

The calculation of stresses in roof trusses being the simplest of all problems in graphic statics, error in calculation would appear to be almost impossible. Yet it is somewhat easy, especially to one whose time is so much absorbed in routine work, to fall into the error of treating the loading of simple structures as a whole, and adopting standard diagrams for the calculation of stresses therein, instead of applying each load separately and plotting-out a special stress diagram for the particular case in point.

The following instance, which came to the writer's notice in the preparation of plans for alterations to a small house, is an illustration of the amount of error which may occur even in the simplest form of roof shown in fig. 3, which is an outline diagram of a simple roof-truss for a retort-house whose width is 35 feet, to be constructed of steel and covered with tiles. The load is calculated at 4 tons per truss; and the roof must be made strong enough to carry an additional load of, say, 32 cwt. when lifting retorts and other materials is being carried out—thus making the total load 5 tons 12 cwt.

The stress diagram (fig. 2) is constructed in the usual manner for that load—showing a maximum stress in rafters of 5 tons 12 cwt., and in ties K H 4 tons 18 cwt., L M 2 tons 4 cwt. If, however, "W = 1·6 tons" be inserted in the position at which the additional load will be actually applied, the stress diagram will be as at fig. 1; and it is interesting to see how much this corrected diagram differs from the one at fig. 2.

The maximum stress in the rafters is now 6 tons 16 cwt.; that in the tie K H 6 tons 1 cwt.; and in the tie L M, 4 tons 2 cwt.—very nearly double that shown in the original diagram.

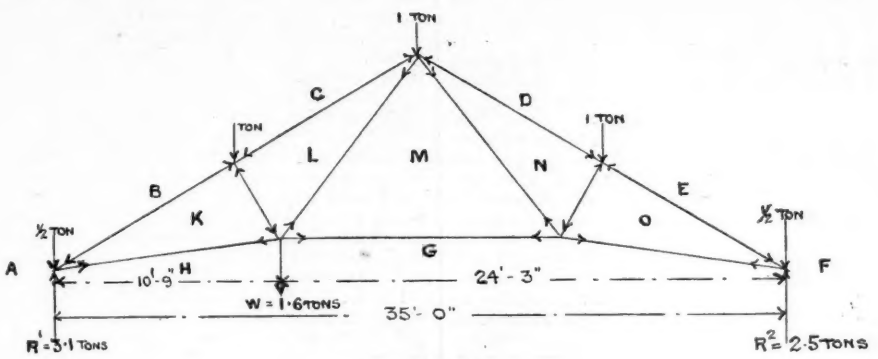


Fig. 3.

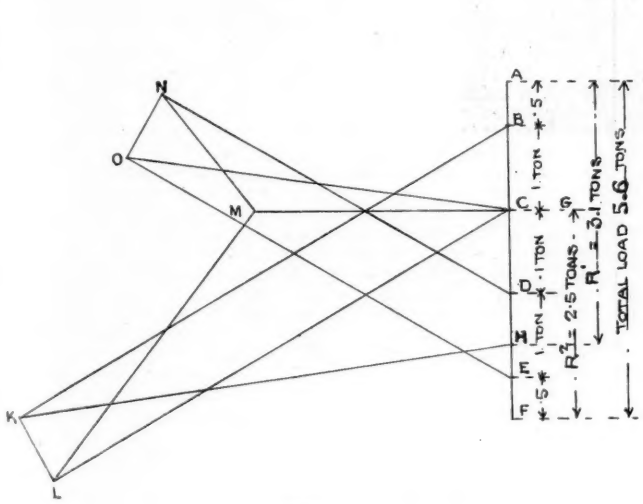


Fig. 1.

Linear Scale: ½ inch to 1 foot.

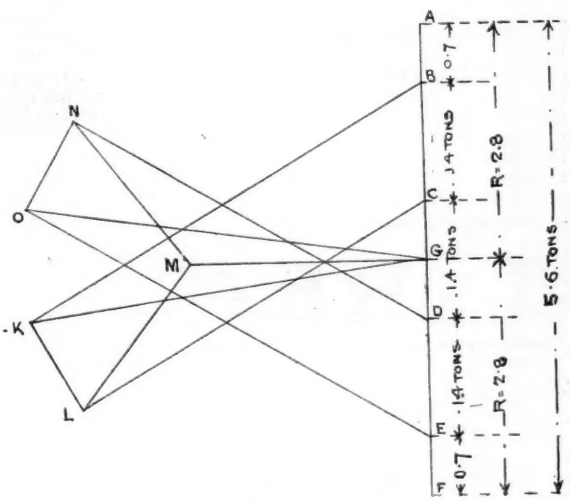


Fig. 2.

Load Scale: ½ inch to 1 ton.

TABLE OF STRESSES (*Maximum*).

		Fig. 1.	Fig. 2.
Rafters	BK ..	6 tons 16 cwt.	5 tons 12 cwt.
Struts	KL ..	0 ,, 18 ,,	1 ,, 4 ,,
Ties	KH ..	6 ,, 1 ,,	4 ,, 18 ,,
,,	LM ..	4 ,, 2 ,,	2 ,, 4 ,,
,,	MG ..	3 ,, 1 ,,	2 ,, 17 ,,

Next Year's International Gas Exhibition at Antwerp.

We printed last week a letter from Mr. A. F. P. Hayman, Chief Engineer and Manager for the Imperial Continental Gas Association at Antwerp, in which he drew the attention of readers of the "Journal" to the forthcoming gas exhibition in Antwerp. Further details are now to hand. The exhibition has been organized under the auspices of the Antwerp branch of the Imperial Continental Gas Association; and a Special Executive Committee has been formed for the purpose. The exhibition is to be held in the buildings of the Société Royale d'Harmonie, Chaussée de Malines; and its sole aim and object is propaganda work, applied to all branches of the gas industry. It is hoped that various competitions will also be arranged. Any surplus of receipts over expenditure will be devoted in some way to further propaganda work. The opening of the exhibition is fixed for Saturday, Feb. 22; and it is to be closed on Easter Monday, March 24. The last day for applications for exhibiting space is Jan. 1. Mr. Hayman recommends that intending exhibitors should make their applications without delay, as space is being very quickly taken up. He adds that there is a particularly good field in Belgium for the latest types of lamps of high intensity, automatic lighting devices, central heating by gas, modern designs in gas heating and cooking stoves, &c., &c. Further details of the rules, and a plan of the spaces to let, can be seen at the "Journal" offices, or can be obtained by application to the Comité de l'Exposition Internationale du Gaz, No. 58, Place de Meir, Antwerp.

We have received from the publishers, Messrs. Hazell, Watson, and Viney, Limited, a copy of "Hazell's Annual" for 1913. The "Annual" has now reached its twenty-eighth year, and has firmly established its reputation as a "record of the men and movements of the time." The contents of the present volume, which occupy 600 pages, have been revised to the 25th ult., and they furnish the latest information on the topics of the day. A copious index allows of easy reference to any subject. The value of such a work is unquestionable. The price is 3s. 6d. net.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

A Meeting of the London and Southern District Junior Gas Association was held on Friday evening, at the Westminster Technical Institute, Vincent Square, S.W.—Mr. D. J. WINSLOW, of the Lea Bridge Gas Company, the President, in the chair.

NOTES ON THE ENLARGEMENT OF A GASHOLDER.

The first item on the programme was a paper entitled "Notes on the Enlargement of a Gasholder," by Mr. W. H. VANNER, of the Walton-on-Thames and Weybridge Gas Company; and this, with a report of the discussion, will be found on pp. 906-9.

PRESIDENT'S ADDRESS DISCUSSED.

There being still some time available on the completion of the discussion of Mr. Vanner's paper, advantage was taken of the opportunity to discuss at length the address which was delivered by the President at the October meeting of the Association. It will be recalled that the address [which was given on pp. 365-370 of the "JOURNAL"] was divided into three sections—colour effects of illumination and coefficients of reflection, gas-boosting plant at Lea Bridge, and an idea for inverted burners.

The PRESIDENT explained that he had brought to the meeting the "Holophane Lumeter," for the benefit of those who had not had an opportunity of seeing it, as well as the box for reflection coefficients. Further, Mr. Clark was kindly exhibiting Lovibond's "Tintometer," with the standard glasses, and he would no doubt be pleased to explain it.

Mr. S. B. CHANDLER (South Metropolitan Gas Company) said the address, on which Mr. Winslow was to be congratulated, represented a great deal of research work, and did something to further the subject of scientific illumination. As far as his own knowledge went, this was the first time that the subject of the coefficients of reflection had been so presented and embodied in a paper. The figures given by their President constituted very interesting data, and might well form the basis of further investigation. He noticed that Mr. Winslow found in his researches that the incandescent mantle approached nearer the spectrum of daylight than did metallic electric lamps. His (the speaker's) opinion was that efforts should be made to maintain this colour effect in incandescent mantles, rather than to alter the mantle constituents to produce grades of colour. They saw the effect of impregnated carbons in electric arc lamps—in many cases it was far from pleasing visually. He thought the simplest way, from the consumer's point of view, to produce colour effect was to utilize suitably tinted glass to secure the colour desired.

Mr. W. H. VANNER (Walton-on-Thames) could not see that it was altogether desirable to use mantles giving different coloured lights for various forms of lighting, because, as had been pointed out, it was possible to use tinted globes. It always seemed to him that a light with a large amount of red rays was especially suitable for those shops selling foreign meat and cheap jewellery. There was at one time on the market, but he did not think it was now, a mantle called the "Sunray." He had one of them specially for testing purposes; but unfortunately after it had been in use a fortnight it got broken. Up to that time, however, it was constantly alight, and the red effect continued. It was not burnt out. As to the burner to take three different sized nozzles and mantles, it seemed to him a very good idea to induce the consumers to buy their burners and mantles from the gas company, because otherwise very often a consumer would go to an oil merchant, and pay 2d. or 3d. for a mantle, which in a very few days would collapse, and give rise to dissatisfaction with the light. The three nozzles, it appeared to him, covered a sufficient range for all domestic lighting. With regard to the boosting plant described, was it used for automatic street lighting by means of a pressure-wave? Further, what was the maximum pressure put on to the district? If it was a good pressure, so that it could reach the outlying parts of the district—because possibly the mains were somewhat small—had any difficulty arisen from consumers living close to the works complaining of excessive pressure? Were there governors or anything to reduce the pressure?

Mr. F. AINSWORTH (Ilford) asked at what pressure the President tested his burner.

Mr. J. G. CLARK (Gaslight and Coke Company) remarked that Mr. Winslow said that to obtain the maximum amount of illumination, the walls should have as high a coefficient of reflection as possible. He (the speaker) presumed, of course, that Mr. Winslow would have regard to a desirable limit. Generally speaking, a coefficient of reflection of 50 per cent. was, in his (Mr. Clark's) experience, a very comfortable one. Anything higher seemed to have a dazzling effect. This would depend upon how far walls were actually utilized for illumination purposes. In the cases where deep reflectors (as Holophane, &c.) were used over the light-sources, the walls did not materially assist the general illumination of the working surfaces; and dark warm colours for the walls were often intentionally used to produce cosiness. A yellow green with a 50 per cent. reflection coefficient was frequently used in schools; and such conditions resulted in bright, but not too brilliant, effects. The desirable illumination of the walls was an open question; but he was inclined to think it should be subordinated to the illumination of the working surface to the extent of 50 per cent. That was, the walls should have about one-half the illumination of the working surface. Coming now to the central feature of the paper, Mr. Winslow had tackled a very slightly explored field; and though he had placed some useful original data at the disposal of members, he (the speaker) was sure he would agree with him it only touched the fringe of a very big subject. He noticed in the paper a reference to the relation between the coefficient of reflection and the colour composition of the light-source. Mr. Winslow made it clear that the one could not be defined without reference to the other, though he (Mr. Clark) had failed to find any allusion to this point in previous work. Text-books had their usual list of coefficients, probably derived from a common source. But no mention was made, so far as he was aware, of the colour of the light-source used; and he thought their thanks were due to Mr. Winslow for having dealt with this aspect of the question. The President mentioned the desirability of obtaining more complete and systematic data on the practical application of coefficients of reflection. He certainly thought that the three factors—viz., total flux from source, reflection coefficient, and resultant illumination—should be co-related in some way. It would be useful to have a list giving data of actual installations, compiled under the three headings previously mentioned. It ought to be possible to classify the various installations; and such a compilation would be of considerable value. He suggested that it would be interesting to the majority of the members if Mr. Winslow would explain how it was that 10 units of yellow and 7 units of blue, yielded 7 units of green and 3 units of yellow. In regard to the inverted burner described by Mr. Winslow, the advantages of this were obvious, and must be of great value from many points of view. He would not be surprised to see the idea taken up by other concerns. He would like to ask if the gas-regulator was secured when once adjusted. It seemed that otherwise the gas consumption might not always suit the particular mantle used.

Mr. W. E. BROWN (Gaslight and Coke Company), referring to the alteration of colours by means of coloured reflectors, said he had had under his notice the case of a butcher's shop, where a red reflector was suggested by somebody, to give a nice appearance to the beef; but the lamp makers consulted scouted the idea that any good would be done by making the reflector a red one. What did the President think of this?

Mr. S. A. CARPENTER (North Middlesex Gas Company) said he thought the most important part of the address was the record of Mr. Winslow's research work into the question of colour, or rather reflection of different colours. Of course, it was common knowledge that the reflection varied very much with different coloured papers, furniture, and so on; but he had not seen any figures before, in text-books at any rate, which gave the extent to which this variation took place. It was, to his mind, a most useful record. It touched a very important point that often cropped up with an inspector who had to deal with complaints of bad lighting. Very frequently a consumer would complain of the bad lighting (say) in his dining-room; and, as they knew, it was common in dining-rooms to have dark papers and furniture. The result was that they got the effect of bad lighting, though probably the incandescent burners were doing good duty. Sometimes a consumer, while condemning in very strong terms the lighting of his dining-room, would admit that there was a good lighting effect in his drawing-room, where there were light furniture coverings and paper. Of course, the difference was entirely due to the reflecting power of the room itself. He believed the President recommended that the "Holophane Lumeter" should be in the hands almost of every man who had to deal with lighting; and in cases he (the speaker) had come across, it would be very useful to demonstrate to consumers that the fault was not with the source of light but with the reflection. The best artificial light, he supposed, was that which most nearly approached daylight; and he believed gas came closest to the ideal form of illuminant in this particular respect. There was too much green in the light given by the incandescent mantle; and he thought mantle makers should see if they could not get rid of some of the green rays. The difficulty of choosing colours by daylight which had to be used for evening wear was a very important point. With regard to the burner, Mr. Winslow, of course, made out a strong case from the storekeeper's point of view. The number of different parts that had to be kept in store, as Mr. Doig Gibb had remarked, was somewhat appalling. On the other hand, he thought a large burner with a bijou fitting, or *vice versâ*, was hardly desirable. As competition was so keen that little points like this might affect the choosing of gas or electricity, he thought this matter ought to be given due consideration; and one should try to get a suitable burner, rather than study the storekeeper.

Mr. AINSWORTH remarked that the electrical people claimed a great deal with regard to their light being nearest daylight; but, as everyone knew, they claimed a lot. It seemed to him that, in going round the streets, if they noticed the gas and electricity, there was no comparison, so far as lighting was concerned. In this respect the electrical people were not making the progress they said they were. He was rather surprised to find that Mr. Winslow used the Graetzin burners, as his own experience was that they were liable to create a certain amount of trouble where there was a considerable pressure—especially for outside lamps. Then, in the President's burner the nozzles were rather long, and must come nearly to the bottom of the mantle. Of course, this depended on the depth of the mantle; but he was speaking of the ordinary size. In the laboratory one could set burners to give excellent results; but could these results be maintained on the

district? They had to consider what was the best for the consumer to deal with. Therefore they should get the burner which required the least adjustment. He was afraid if they got too near the mantle with the nozzle, there would be difficulty.

The PRESIDENT, in reply, referring to Mr. Chandler's allusion to screening light, in lieu of altering of the colour characteristics of the mantle itself, said his chief point had been to get the colour characteristics of the mantle altered for shop illumination purposes where necessary. It was all very well to recommend a butcher to put on a red reflector or globe; but this, to his mind, was an unsatisfactory solution. His idea, of course, as mentioned in the address, was not to get the very rich colours they had with electric flame arcs, neither was it to resuscitate the mantles they had years ago. They used to have mantles of a reddish salmonish tone that worried everyone. So far as this point went, he should like to bring out that a good many gas men thought that the colour of the mantle was all that could be desired. He believed it had been mentioned in the Press that when one got a good white mantle, the same as at present in use, this was all that was wanted. It might be all right for private house lighting, where the owners might select globes and shades to suit their own taste; but it was hardly sufficient for the various stores, and usual tradesmen. It was not only foreign butchers that needed a good red-yellow light; others required it as well. He had a case some two months ago of a man coming into their district, who had electricity in all his other shops. This man sold poultry, bacon, eggs, &c., and he (the President) thought he would like to see whether he could convince him. The shop-keeper said first of all it was a question of heat, then of light; but at rock-bottom it turned out to be a question of colour. He challenged him (Mr. Winslow) to point out how many butchers' shops had gas. Very soon they found a good pork butcher who had gas-lamps outside and gas and electric lighting combined inside. In fact, they found several butchers with gas-lamps both inside and outside not very far away, but one shop in the town had tungsten lamps with opal shades, on outside arms, which reflected directly on to the carcases and joints, &c., and the effect was very good. The gas business could be considerably increased if they had mantles which would meet the point of colour effect. As to buying mantles of the gas company, at Lea Bridge they put on the "Universal" nozzle so that anybody could go to the nearest ironmonger and obtain a mantle; but where they obtained the contract for maintenance, they put on the smaller nozzle. Unfortunately, they had no control over the street-lamps in the district. They were in the hands of the Council, who owned their own electricity undertaking. His Company simply supplied the gas. The maximum pressure was 50-10ths. The governors were of ample size, and also the mains leaving the works; and at various points on the district, these were connected, thus ensuring very good and uniform pressure. The pressure was 30-10ths in the daytime, and a little more during the cooking hours. In answer to Mr. Ainsworth, the pressure at which the burner had been used in the coefficient box was 17-10ths, and the pressures for the three-in-one burner were given in the paper. He quite agreed with Mr. Clark that the illumination of walls should be about one-half of that on the working plane. The eyes tended to follow the maximum amount of light. That was to say, with indirect systems, he thought the eye tended to look up to the ceiling more than should be the case; and this did not help the concentration of thought which was sometimes so essential. He would recommend the maximum effect from the walls, or they were more or less putting their lights under a bushel. They should get as much from the walls as they could without destroying the beauty of them. He did object to the deep red wallpapers one often saw in dining-rooms. He was afraid in the average house they did not get a 50 per cent. coefficient of reflection. As Mr. Clark had said, the address only touched the fringe of a very big subject. With regard to the colour test, he thought this was a simple method. Screened standardized glasses gave them definite information by which, as he had attempted to show, they could arrive at the colour composition of the light. Mr. Clark spoke of the 10 units of yellow and 7 units of blue. Of course, this was Lovibond's nomenclature. He had fixed an arbitrary standard, by which it was possible to define any colour in numerical terms. Glasses were standardized from ·01 to 20, and he had taken red, yellow, and blue, because he had found them easy to work; but he could produce green by a combination of yellow and blue. Thus, 10 units yellow and 7 of blue gave 7 each of yellow and blue, making 7 of green with an excess of 3 units of yellow. He thought the gas-regulator should always be free to be regulated. It should not be fixed (as it was really not much use fixing a regulator, because mantles would vary in size), unless special circumstances, as excessive vibration, should require it. Mr. Brown suggested alteration of colours by coloured reflectors. His purpose, however, was to enable them to do it by the mantles, and not by artificial methods. He certainly agreed that gas men ought to have the "Holophane Lumeter" in their hands. It was a very converient instrument. Mr. Carpenter had also mentioned the green light of mantles. The address stated differently. He had shown there was no extra amount of green rays in the gas mantle. It was red rays the mantle excelled in; and it was the same with the ordinary tungsten lamp. He said the incandescent mantle had about the same quantity of green as daylight. Some of the green appearance they saw with incandescent lighting was due to the bad glass used in street-lanterns, and also to the sensation produced by seeing so much of the red rays in most other sources of light. As to the statement that it did not appear to be quite in the ordinary course of things to use a bijou mantle with an ordinary sized globe, he spoke of this bijou mantle not as a bijou mantle as they knew it, but a bijou Graetzin mantle, which he mentioned was of the same size as the medium inverted or "Nico" No. 6. He had not attempted to put a small bijou mantle on this burner. Mr. Ainsworth inquired why he took the Graetzin burner. He quite agreed with him that the Graetzin outside lamp as they used to know it was not satisfactory. There had, however, been other types since then. But the chief regrettable point about most German outside lamps was their almost complete disregard of the maintenance principle. This, however, was the Graetzin burner; and it did not matter which burner was used, provided it was an efficient type, as the object of the experiment was to ascertain the effect of the lighting value of the mantle. As to the long nozzle, this was better than shortening the mantle. Moreover, it suited the composition of their gas, because it gave a very short, hot, and intense flame. With an ordinary North Country type of nozzle half this length, they would have to pass more gas to get the ordinary inverted mantle well filled. They had sold grosses of the burner referred to in his address. The price of the burner and mantle complete was 1s. 6d.; and consumers in other companies' districts had bought a considerable number of them at the Lea Bridge show-rooms.

A hearty vote of thanks was accorded to the President.

PEAT FUEL FOR THE PRODUCTION OF POWER.

Experiments at the Fuel-Testing Station at Ottawa.

In the "JOURNAL" for Nov. 19 (p. 594), reference was made to a paper on the subject of the utilization of peat for power production, presented by Mr. B. F. Haanel, B.Sc., Chief of the Fuel-Testing Division of the Canadian Department of Mines, at the Eighth International Congress of Applied Chemistry. It was then mentioned that a producer had been installed at the Fuel-Testing Station at Ottawa, where exhaustive experiments had been conducted to determine the suitability of peat for the purpose named. We have just received a copy of Mr. Haanel's report on the experiments referred to, and the following are some extracts from its contents.

The primary object in establishing a fuel-testing station at Ottawa was to demonstrate that peat could be economically utilized as a fuel for power purposes in a producer-gas plant. It was subsequently decided, however, to extend the scope of the investigations; and the plant was installed for testing various kinds of fuels met with in Canada, with the view of showing the great saving which could be effected by the use of peat.

In order to ensure an orderly arrangement of the record of his many experiments, Mr. Haanel has divided his report into two parts: (1) A description of the producer gas plant, and the cleaning system, as originally constructed and installed at the testing-station, with complete detailed records of the trials and tests conducted therewith; and (2) a description of the alterations carried out in the plant by the makers, to which are added complete detailed records of the trials and tests conducted after the alterations had been made.

EQUIPMENT OF THE STATION.

The testing-station is equipped with a 60 H.P. double-zone Körting gas-producer, with wet coke scrubber, tar filter, and dry scrubber, and a Westinghouse 100 H.P. bituminous suction gas-producer, and a 60 H.P. four-stroke single-acting Körting gas-engine. A 50 kilowatt direct-current Westinghouse electric generator is connected direct to the engine. A small crusher, driven by an electric current motor, is placed in the peat shed, where the peat blocks, as they arrive from the bog, are crushed to the size most suitable for the producer. The chemical laboratory is located at one end of the producer floor, and is provided with the necessary apparatus for making complete gas and fuel analyses and determinations of the calorific value of the fuels. The latter are made with a Junkers calorimeter, provided with a small exhauster driven by a 0·1 H.P. motor, which delivers gas at constant pressure to the calorimeter.

The author fully explains the theory of producer gas, and then proceeds to describe the plant employed in its manufacture. The producer consists of a rectangular steel shell, 2 ft. 9 in. by 5 ft. 2 in., and 15 feet high from the floor to the top of the charging-hoppers. For cleaning and the removal of ashes, twelve doors are provided—four on each side, and a like number on the back. In order that a sufficiently cooled gas, free from tar and dust, may be delivered to the engine, the gas, after leaving the producer, passes through a cleaning system, composed of a wet coke scrubber, containing about 500 lbs. of coke, a tar filter, and a dry sawdust scrubber. The author describes in detail the gas-engine and the equipment of the gas analysis laboratory, and then explains the methods of making pyrometric measurements and sampling the gas and peat. In order to obtain a general sample of peat which would be as nearly as possible representative of its condition when fired, a portion was taken from every 50 lbs. charged into the producer. These samples were collected in a large can provided with a tight-fitting cover. At the end of the trial, the

peat in the can was pulverized and an average sample taken for analysis and the determination of moisture.

Results of Tests.

After these preliminaries, Mr. Haanel gives the results of some gas-producer tests; the first being with the peat manufactured at the bog of the Mines Department, near Lindsay, Ontario. On these tests, he makes the following remarks:

The dry condition and the large amount of fusible ash in the peat, coupled with the high working temperature which could not be controlled, caused the formation of clinkers, and interfered, to some extent, with the regular operation of the producer. The trouble most noticeable was the irregular feeding of the fuel into the lower zone. This was caused by clinkers adhering to the walls above the doors provided for poking, and resulted in "scaffolding." The large hollow spaces thus formed in the lower zone caused irregularity in the composition of the gas, and the formation of some tar, due to the feeding into the lower zone of uncoked peat; for, when the clinkers broke away, on account of the weight of fuel resting on them, or when broken away by poking, large quantities of green or partially coked peat dropped into this zone from the upper portions of the producer, instead of passing slowly and regularly down through the upper zone. The tar carried over through the cleaning system, only gave trouble at the admission-valve, which showed signs of sticking several times during the trial. This trouble was, however, easily overcome by dropping a little gasoline around the spindle of the valve. The irregularity in the composition of the gas was easily taken care of by the air and gas regulating valve; and at no time during the trial was this irregularity serious enough to necessitate a reduction of the load carried on the engine.

In a table accompanying these remarks are recorded the observations taken at 15-minute intervals—the watts, the horse power at the switchboard, the brake-horse-power developed at the engine, and the average brake-horse-power developed during the trial. In addition, the time of poking and charging the producer are included in the table. The following is an analysis of the peat used during the trials:

	Per Cent.
Volatile matter	69·5
Fixed carbon	25·2
Ash	5·3
	100·0

Calorific value per pound, 8650 B.Th.U.

Mr. Haanel explains that the high percentage of peat was due to a large quantity of free sand in the peat. The analysis was made from a general sample of the peat contained in the entire bog, obtained before manufacture began. The following is a summary of the results of the test, the duration of which was 7 hrs. 30 min.

Average volts	124
,, amperes	311
,, watts delivered at switchboard	38,700
,, H.P. at switchboard	51·9
,, B.H.P. developed at engine	58·9
Moisture content of fuel	13 per cent.
Ash content of dry fuel	10 ,,
Calorific value per pound of dry fuel	8,650 B.Th.U.
Total fuel as fired	904·00 lbs.
,, ,, ,, calculated dry	786·00 ,,
Fuel consumption per hour as fired	120·50 ,,
,, ,, ,, calculated dry	104·90 ,,
,, ,, ,, B.H.P.-hour as fired	2 04 ,,
,, ,, ,, ,, calculated dry	1·78 ,,
Speed of gas-engine	200 r.p.m.

This test was made on Feb. 24, 1910. Another, extending over twelve hours (10 a.m. to 10 p.m.) was made on the 28th of the month. In respect of it Mr. Haanel says:

During this test, the producer was poked every two hours. A considerable quantity of water was admitted through the lower fire-doors by two pipes connected to the water-main and the two sides of the producer, just above the fire-doors. Most of this water found its way into the gas-chamber just below the grate-bars, and thoroughly saturated the ashes which had accumulated there. It was believed that the hot gases flowing through the chamber would take up a certain amount of moisture, which, in passing through the hot carbon of the lower zone, would be decomposed, and thus cool the fuel-bed sufficiently to prevent the formation of clinkers. To a certain extent, this device materially improved the operation; but it was found that moisture could not be effectively introduced in this manner. The feeding of fuel from the upper into the lower zone was more regular, and no noticeable air spaces occurred in the lower bed. Moreover, the tar carried past the cleaning system did not at any time prove more troublesome than in the previous run. The fuel consumption was, however, noticeably higher.

As in the case of the previous tests, the results are fully tabulated; but they may be summarized as follows:

Average volts	126
,, amperes	303
,, watts delivered at switchboard	38,070
,, H. P. at switchboard	51·0
,, B. H. P. developed at engine	58·0
Moisture content of fuel	13 per cent.
Ash content of dry fuel	10 ,,
Calorific value per pound of dry fuel	8,650 B.Th.U.
Total fuel as fired	1,704·00 lbs.
,, ,, fired dry	1,482·00 ,,
Fuel consumption per hour as fired	142·00 ,,
,, ,, ,, calculated dry	123·00 ,,
,, ,, ,, B.H.P.-hour as fired	2·45 ,,
,, ,, ,, ,, calculated dry	2·12 ,,
Speed of gas-engine	200 r.p.m.

A third test was made from 8 a.m. to 6 p.m. on the 2nd of March, on which the following observations are offered:

During this trial, the producer was only poked and cleaned at the beginning and end. Water was introduced in the same manner as in the preceding trial. The producer was charged whenever the fuel dropped to a certain level in the hoppers; and since the times of charging happened to fall at irregular intervals, the hourly amounts were calculated so that the fuel consumption per B.H.P.-hour for every hour could be determined. The consumption of fuel per B.H.P.-hour for the last five hours was very regular, which indicates the uniform operation of the producer after the fifth hour. The irregularity of fuel consumption during the first five hours was probably due to the fact that the producer was not properly cleaned of clinkers produced during the previous days' run. After being released from the walls of the producer, these dropped to the bottom, and were softened sufficiently by the moisture introduced through the fire-doors to cause no further interference in the uniform feeding of the peat coke from the upper to the lower zone. No trouble was caused by tar at the engine; and the trial generally was very satisfactory.

The following is a summary of the results of this test:

Average volts	126
,, amperes	323
,, watts delivered at switchboard	40,590
,, B.H.P. developed at engine	61·80
Moisture content of fuel	13 per cent.
Ash ,, ,,	10 ,,
Calorific value per pound of dry fuel	8,650 B.Th.U.
Fuel consumption per hour, as fired	123·40 lbs.
,, ,, ,, calculated dry	107·40 ,,
,, ,, ,, B.H.P.-hour as fired	1·99 ,,
,, ,, ,, ,, calculated dry	1·73 ,,
Speed of gas-engine	200 r.p.m.

Mr. Haanel next gives the results of tests made with the peat manufactured at the Government plant at Alfred. Before starting them, considerable time was spent in ascertaining the size to which the peat should be crushed in order to obtain the best results in the producer. It was found that peat containing 30 per cent. of moisture should be crushed to about the size of a hen's egg; while for that with less moisture larger sizes might be used, though the smaller sizes offered no difficulties to the operation of the producer, regardless of the moisture content. The crushing was accomplished by a modified stone pulverizer, driven by a 5 H.P. motor. The power furnished by this motor was altogether too high; one of 2 H.P. being amply sufficient to do the work. The following is the average analysis of dry peat from the five tests:

	Per Cent.
Fixed carbon	30·8
Volatile matter	63·1
Ash	6·1
	100·0

Calorific value per pound, 9460 B.Th.U.

The first test was made on Dec. 6-7, 1910; and during it the producer and engine were operated continuously at full load for 30 hours, for the purpose of determining the fuel consumption per B.H.P.-hour, the uniformity of the quality of the gas, the consumption of water for cooling purposes, and the general behaviour of the plant during a period of this duration. Previous to the trial, the producer had been standing idle for some time; consequently it was comparatively cold when the trial commenced. Mr. Haanel's remarks upon it are as follows:

During the first ten hours, considerable tar was carried past the cleaning system into the mixing and admission valves and into the cylinder of the engine; but, owing to one of the properties of peat tar, especially of the tar resulting from the distillation of peat at low temperatures—namely, its complete solution in a mixture of oil soap and water—no trouble was experienced which necessitated a reduction of the load. During the remainder of the test, the condition of the producer steadily improved, and the operation of the plant throughout the last ten hours was satisfactory with the exception of the accumulation of tar on the valve-seat and spindle of the gas-inlet valve, which caused some sticking. To overcome this, a mixture of oil soap and water was dropped on the valve-spindle. At the termination of the trial, the producer was in excellent condition, and the gas contained but little tar. Under these conditions, the plant could have been operated continuously for almost any period.

All the principal data of the test are given in a table, and they show the uniformity of the gas in composition and calorific value. The lowest heating values always occurred immediately after poking; but, with very few exceptions, the calorific value of the gas never dropped low enough to necessitate a change in the proportion of the mixture of gas and air. The fuel consumption in pounds per B.H.P.-hour was calculated for peat containing 25 per cent. of moisture, and also for dry peat.

The following is a summary of the results of this test:

Average volts	109
,, amperes	350
,, watts delivered at switchboard	38,202
,, H.P. delivered at switchboard	51·2
,, B.H.P. developed at engine	58·2
Moisture content of fuel	29·3 p. ct.
Ash in dry fuel	6·0 ,,
Calorific value per pound of dry fuel	9,470 B.Th.U.
Total fuel fired	4,900 lbs.
Fuel consumption per hour	163 ,,
,, ,, ,, B.H.P.-hour as fired	2·81 lbs.
,, ,, ,, calculated to 25 per cent. moisture	2·65 ,,
Fuel consumption per B.H.P.-hour calculated dry	1·98 ,,
Water ,, ,, ,, for producer	2·61 galls.
,, ,, ,, ,, ,, engine	2·14 ,,
Speed of gas-engine	200 r.p.m.

The remaining tests, which, as already stated, were made at three-fourths, one-half, one-fourth, and full load respectively, were carried out for the purpose of determining the fuel consumption per B.H.P.-hour at these loads, and the load at which the producer operated the most satisfactorily. During these tests, with the exception of the one run at one-fourth load, the gas was sampled and analyzed every hour. The fuel consumption was determined for every hour, and the temperature of the gas in the off-take observed every fifteen minutes. From these data and the switchboard observations were calculated the electric-horse-power and the average brake-horse-power developed at the engine during each hour, the composition and calorific value of the gas, the temperature of the gas in the off-take, and the fuel consumption per hour per brake-horse-power.

The results of the tests are given in tables and shown diagrammatically, accompanied by explanatory observations by Mr. Haanel. They are summarized in the following table:

Loads carried on engine.	Quarter.	Half.	Three-Quarter.	Full.
Average—				
Volts	107·4	111·6	115·7	123·3
Amperes	98·5	192·6	304·1	320·2
Watts at switchboard	106·0	215·1	351·8	394·9
H.P. at switchboard	14·2	28·8	47·1	52·9
B.H.P. developed at engine . . .	16·1	32·7	53·6	60·1
Moisture content of fuel, per cent. .	37·5	31·8	33·3	35·0
Ash in dry fuel, per cent.	6·0	6·6	6·4	6·1
Calorific value of dry fuel, B.Th.U. per lb..	94·6	94·6	94·4	950·0
Total fuel fired, lbs.	96·5	10·6	15·8	155·5
Average fuel consumption—				
Per hour, lbs.	96·5	10·6	1·58	155·5
Per B.H.P.-hour as fired, lbs. . .	6·14	3·25	2·95	2·59
Per B.H.P.-hour as calculated to 25 per cent. moisture, lbs.. . . .	5·12	2·95	2·62	2·24
Per B.H.P.-hour as calculated dry, lbs.	3·84	2·22	1·97	1·68
Water consumption—				
Gallons per B.H.P.-hour, producer .	16·60	10·31	5·90	4·98
,, ,, ,, engine .	5·40	2·60	2·10	2·08
Speed of engine, revs. per minute . .	20·10	2·00	1·98	1·98

Formation of Tar.

Mr. Haanel next takes up the subject of the formation of tar. He explains that the bye-products resulting from the distillation of peat at temperatures obtaining in the producer consist of heavy and light tars, paraffin oils, ammonia, &c.; and the quantity of these products depends to a very large extent on the moisture content of the peat when fired. Most of the heavy tar is condensed and separated in the water-cooled pipe which connects the upper and lower zones of the producer. This tar drops into the water-seal at the bottom of the pipe, and takes no further part in the formation of the final producer gas. The remaining products, such as lighter tar and paraffin oils, escape condensation in the water-cooled pipe, and pass into the lower zone of the producer. In passing through the hot peat coke, some of these light tars and oils interact with carbon, and form permanent gaseous compounds; but the physical and chemical character of a part of the tars and oils is not changed, or at best very slightly, and they pass with the final producer gas to the cleaning system. In passing through the coke scrubber, a large amount of the lighter substances is separated out, and passes off with the cleaning and cooling water; while a considerable quantity of the products still remaining is separated out in the tar-filter, which is continually washed by sprays of hot water. The wet coke scrubber and the tar-filter separate the bulk of these products from the gas, and leave it comparatively clean.

According to the temperature conditions obtaining in the producer, and the moisture content of the peat when fired, the gas after it leaves the cleaning system still contains more or less tar carried in a very finely divided state, which gives the gas the appearance of a fog or mist. It is evident, therefore, that the formation of the final producer gas, or, in other words, the gas which leaves the producer, can only be altered by varying either the internal temperature of the producer or the moisture content of the peat. When the moisture cannot be varied, the temperature can only be increased or decreased by increasing or decreasing the load carried on the engine.

Dealing with the effect of temperature on the formation of tar, and referring to the figures in the preceding table, Mr. Haanel says the lowest average temperature occurred in the test of one-fourth load. The peat used during this test contained the highest percentage of moisture—viz., 37·5 per cent.; but the tar carried by the gas past the cleaning system was scarcely noticeable, and caused absolutely no inconvenience whatever in the operation of the engine. The distillation products during this test consisted mainly of paraffin oils, which were either partly separated by the cleaning system before entering the engine, or passed into the engine and burnt in the combustion chamber along with the permanent gases. The temperatures prevailing during the half and three-quarter loads were considerably higher; while the character of the bye-products was noticeably different, both physically and chemically—the percentage of light tars being quite predominant. The gas made during these two tests was, however, remarkably free from tar.

The greatest amount of tar was formed during the test at full load; the quantity of paraffin oils being comparatively very small. The average temperature during this trial was higher than that during any of the former trials at lower loads. The tar carried past the cleaning system was, however, at no time serious.

On the subject of the moisture content of the peat on the formation of tar, the author states that when the percentage of moisture is high, the heavy tar resulting from the distillation carried on in the upper zone of the producer condenses in very large quantities on the walls of the gas-chamber leading to the water-cooled pipe, and also in the pipe itself. When the moisture content of the peat is much in excess of 40 per cent., the tar during a run will often completely choke the chamber and the damper boxes on the top end of the pipe. When the peat contains moisture much in excess of this amount, the quantity of tar produced is so large as to make the successful operation of the plant, under the present conditions, impossible. Since it works well at low loads when the moisture content of the peat is high, it would appear that, to operate satisfactorily at high or full loads with such peat, the capacity of the producer would have to be considerably increased. Dealing with peat containing from 25 to 30 per cent. of moisture, no difficulties are met with when running at loads varying from zero to full.

In his concluding remarks on this subject, Mr. Haanel says it may be stated that a peat gas power plant can be operated continuously under adverse conditions regarding tar without any serious amount of trouble. The main trouble is caused by the deposition of tar on the rings of the piston, and the deposit of carbonized tar at the back of the cylinder. In any case, the piston as well as the back of the cylinder can be easily and entirely cleaned by injecting into the open end of the latter a mixture of oil soap and water. This completely dissolves the tar, which is then thrown out by the forward stroke of the piston. Such an operation occupies very little time, and may be resorted to while the engine is running without in any way injuring it. This method of cleaning is always a dirty operation, and the plant should be so improved that this work could be dispensed with.

The peat gas power plant has a distinct advantage over one utilizing bituminous coal. In the latter case, the accumulation of tar in the valves and cylinder is likely, if deposited in large quantities, to result most seriously—necessitating shutting-down the engine, removing the piston, and complete cleaning of the engine; since the cylinder and piston cannot be cleaned by washing with the above-named mixture. When this method of cleaning is tried, the oily matter of the coal tar is dissolved out, leaving behind a stiff sticky mass, somewhat of the nature of pitch, which holds the piston and piston-rings so tightly as to make their removal almost impossible. This cleansing, if resorted to while the engine is running, would probably result in an accident caused by the "seizing" of the piston.

[Some extracts from the second part of Mr. Haanel's report will be given in a subsequent issue.]

Chemistry in Gas-Works.

This is the title of two lectures to be delivered before the Institute of Chemistry, by Mr. W. J. A. Butterfield, M.A., Assoc. M.Inst.C.E., F.I.C., in the Chemical Lecture Theatre of University College, Gower Street, W.C. The first will be given on Thursday, and the second next month. In the course of his lectures, Mr. Butterfield will deal with the bearing of the magnitude of the operations in gas-works on the work of the chemist; the correlation between the character of a town gas supply and the different uses to which gas will be put; and the methods of investigating the fitness of various descriptions of gas for different uses. He will consider the chemical aspects of prevalent methods of manufacturing coal gas and water gas, and explain the principles of construction and the control of furnaces on gas-works. Other subjects to be taken up will be the impurities of crude gas and the methods for their removal; the effect of impurities on the plant at the works and on the consumers' fittings; and the bye-products of gas making. The lecturer will show how the cost of manufacture and the distributing charges affect the choice of the grade of gas which should be supplied; indicate the degree of accuracy which is of practical utility in analyses for the control of gas-making operations; discuss the methods of investigating the efficiency and utility of appliances for the use of gas for heating, lighting, and other purposes; point out the directions in which chemical research is called for; and offer some remarks on the qualifications and training requisite in a gas-works chemist.

Mr. Gilbert Rigg, of the New Jersey Zinc Company, has discovered that sodium tungstate prevents the rusting of iron and steel. A solution composed of one part of the tungstate in 2000 parts of water is efficient. This is applied to zinc oxide paints; and zinc tungstate is ground with the paint and protects the metal to which it is applied.

Mr. Henry John Davis, the Chairman and Managing-Director of the Davis Gas-Stove Company (a Director of Meters Limited), whose death was recorded in the "Journal" for Sept. 10, left estate of the gross value of £28,656. Mr. David Frank Schloss, formerly of the Board of Trade, whose work in connection with profit-sharing and co-partnership statistics was referred to last week, in the introduction to the notice of the report on the subject recently issued, left £55,033.

NOTES ON THE ENLARGEMENT OF A GASHOLDER.

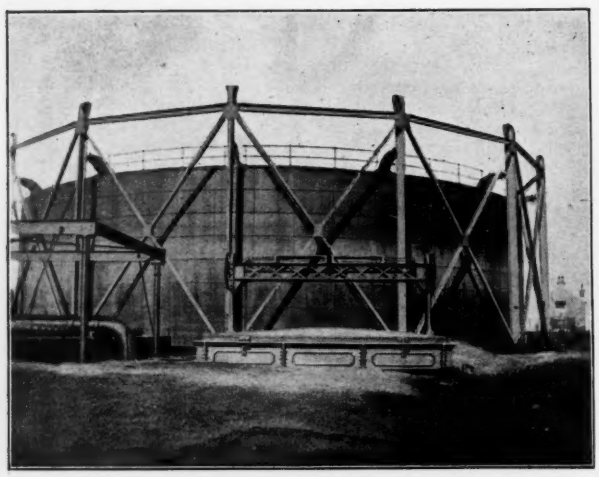
By W. H. VANNER, of the Walton and Weybridge Gas Company.

[A Paper read before the London and Southern District Junior Gas Association, Dec. 13.]

My object in bringing to your notice the details of the work of enlarging the storage capacity of one of the holders at the Walton-on-Thames Gas-Works is that it is not the good fortune of every junior to be engaged in the service of a gas undertaking at the time that a holder is being erected or an enlargement of an existing holder carried out. This paper is not a treatise on gasholders, nor am I prepared to go into the problems which have to be solved in designing holders generally; and for this reason, if to some gentlemen present to-night my remarks should appear elementary, I must ask their kind indulgence.

A holder is one of the costliest items in the equipment of a gas-works, and therefore should have the closest attention of engineers, in specifying materials of the very best, employing only trustworthy and efficient contractors, and giving proper supervision to the work in order to ensure that it will be carried out in a proper manner. I do not believe in cutting prices too low, as this can only be brought about by introducing some inferior quality materials and scamped workmanship, or by paying a low rate of wages.

Before having the holder enlarged, our storage capacity was not equal to the heaviest output in 24 hours—viz., 450,000 cubic feet. I believe in having a storage capacity equal to this output as a minimum. Our storage consisted of two small double-lift holders and one single-lift holder (the subject of this paper). The storage capacity before the enlargement of the holder was 399,000 cubic feet, and after enlargement, 786,000 cubic feet.



The Holder before Enlargement.

The pressure given by the double lifts was 55-10ths each, and the single lift 37-10ths. When the small holders uncupped, the pressure, of course, dropped. A careful watch had to be kept when working out of one of the small holders, if a greater pressure was required than the pressure thrown by the inner lift. Fortunately, a booster was available. The outlet-pipes of the holders were connected to this, so that greater pressure might be obtained at the governor-inlet by simply boosting.

Insufficient storage causes needless anxiety on the part of the official in charge during the time of the year that the demand for gas reaches its maximum; and if those in authority for the time being cannot be induced to increase it, the state of affairs is worse when the same period comes round the following season.

TANK.

The tank is composed of concrete rendered on the face with neat portland cement, and has an internal diameter of 100 feet by 28 feet deep from the top of the coping to the upper face of the rest-stones. At the time the tank was designed, it was intended for a three-lift holder; but when the tank was constructed, the inner lift only was erected, the size of same being 93 ft. 7 in. by 28 ft. 6¼ in. deep.

INNER LIFT.

The cup is formed of $\frac{3}{16}$-inch plate, 8½ inches wide, and 2 feet deep on the inside and 18 inches on the outside, with a 2 in. by ¼ in. stiffening-ring riveted with $\frac{5}{8}$-inch rivets 6 inches pitch to the upper edge. The side sheets next to the cup and top curb are $\frac{7}{16}$ inch thick, and the intermediate sheets 13 S.W.G. The top curb is of angle steel, 4½ in. by 4½ in. by $\frac{7}{16}$ in. thick, and jointed with angle plates 18 inches long.

The crown sheets joining the curb are 3 feet wide and $\frac{5}{16}$ inch thick. The centre plate is 5 feet in diameter and ¼ inch thick. The row joining this and the outer row is 11 S.W.G. The intermediate plates are 13 S.W.G. On the outer side of the plates 2 ft. 7 in. from the curb is riveted a stiffening-curb of angle steel 4½ in. by 4½ in. by $\frac{7}{16}$ in., jointed with 18-inch angle plates.

Twenty-eight vertical stays formed of tee steel 4½ in. by 4½ in. by ½ in. are secured at each end to side plates with four ¾-inch bolts. Each stay is further secured to the outer row of top plates with a pair of $\frac{5}{8}$-inch gusset plates reaching 3 ft. 6 in. down the side and 2 ft. 7 in. on the crown, and attached to the outer row of plates by tee steel, 5 in. by 5 in. by ½ in. and ¾-inch rivets.

Two manholes are provided, 2 ft. 6 in. by 3 feet, with stiffening-rings and ¼-inch cover plates, and secured by $\frac{5}{8}$-inch set screws, 4-inch centres. The cup-carriages, 28 in number, are formed of $\frac{5}{8}$-inch steel plates, and each bolted to the cup with four ¾-inch bolts. Each carriage is fitted with an 8-inch cast-iron roller, truly bored, and fitted with 1¼-inch turned shouldered pins. The fourteen top carriages are formed of $\frac{7}{16}$-inch plates and 3½ in. by 3½ in. by ½ in. angles, each bolted to a strong adjusting plate with eight 1-inch bolts. Each carriage is fitted with a cast-iron roller 18 inches in diameter, truly bored, and fitted with 1½-inch turned pins. The crown plates are supported, when at rest, by a wooden framing.

EXTERNAL FRAMING.

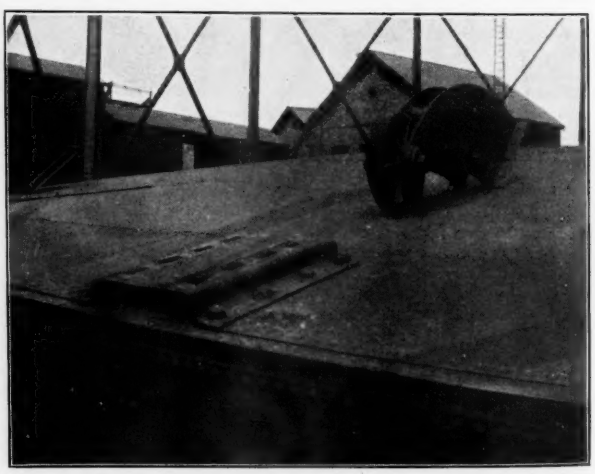
The standards, fourteen in number, are of rolled steel joists 14 in. by 6 in. by 46 lbs. per foot. Each standard is 31 feet. The lower end has a foundation plate 3 feet square and $\frac{5}{8}$ inch thick, with ½-inch gusset-plates joined with angle steel 3 in. by 3 in. by ½ in. The upper end has a $\frac{7}{16}$-inch back junction-plate attached. On the inside flange of each standard is fixed a steel channel; and on the upper end of each standard is bolted a bell-mouth casting. Each standard is secured to the foundation with four 1½-inch holding-down bolts 8 feet long. One row of girders, formed of rolled steel joists 8 in. by 6 in. by 34 lbs. per foot, is secured at each end to the back plate and to the web of the standard with $\frac{7}{16}$-inch flanged gusset plates.

DIAGONALS.

The standards and girders are braced diagonally with 6 in. by 5 in. rolled steel joists 25 lbs. per foot, secured at the outer ends to the back junction plates, and at the centre with $\frac{7}{16}$-inch plates and ¾-inch bolts. A ladder was erected from the ground-line to the top of the girder. The sides are formed of 3 in. by ½ in. flat steel, and the treads of ¾-inch round steel riveted into the sides. The ladder is secured to the girder by suitable fastenings. A landing platform is fixed to the top of the holder near the ladder, and is formed of $\frac{5}{16}$-inch steel plates, and 2½ in. by 2½ in. by $\frac{5}{8}$ in. angle steel. There is a handrail on the top of the curb of the holder, formed of 1-inch gas-tube, in two tiers, 2 ft. 9 in. in height. The standards are 1¼-inches in diameter, with welded feet, 4 in. by 6 in. by ¾ in., and are secured to the outer row of top plates with ¾-inch set-screws. There are fourteen tank-guides, formed of steel channels, 6 in. by 3 in. by ½ in., each secured to the tank wall with ears and eight 1-inch lewis bolts 5 inches long.

The particulars I have just given form a description of the holder as it was at the time the contractors, Messrs. Clayton, Son, and Co., of Leeds, had it handed over to them for enlargement. The contract was for the addition of a middle and outer lift, with suitable extensions of guide-framing. The inner lift is a "flying" lift.

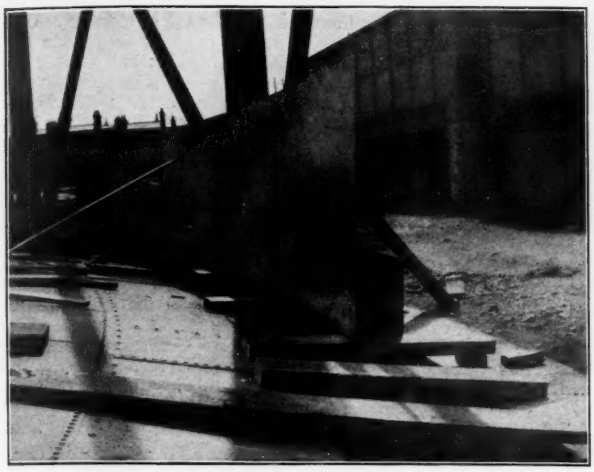
We worked as much of the gas as possible out of the holder. On April 24 last, it was put out of action, the inlet and outlet valves shut, and the syphons sealed; and the two manhole covers on the top of the crown were loosened, and later taken off. We next started emptying the water from the tank by means of a "Pulsometer," into a sump-well. The handrail was removed



One of the Top Carriages Removed.

from the tank-coping, and also the handrail from the crown of the holder. The top carriages and guide-rollers were then disconnected from the crown of the holder. Next stout planks were laid across from the tank-coping to the crown of the holder, and on these the cup sections were assembled right round the tank.

The middle lift is 95 ft. 9¾ in. in diameter by 28 ft. 4 in. deep,



Stout Boards laid across from the Tank-Coping to the Crown of the Inner Lift and the First Two Sections of the Cup of the Middle Lift.

and has a circumference of 301 feet. There are 56 sheets round the circumference. The cup-pieces were sent in fourteen sections, with the first row of sheets next to the cup riveted to same. The cup is similar to the one on the inner lift formed of $\frac{5}{16}$-inch plate 8½ inches wide, 2 feet deep on the inside, and 18 inches deep on the outside, with a 2 in. by ½ in. stiffening-ring riveted on the upper edge with ⅝-inch rivets, 6 inches pitch. The side-sheets next to the cup and dip are $\frac{3}{16}$ inch thick, riveted to same with ½-inch rivets 1½-inch pitch, and to the side-sheets with ⅝-inch rivets, 1¼-inch pitch. The intermediate sheets are 13 S.W.G. After the cup-sections had been set out at the proper radius, the riveting-up of the side-sheets was proceeded with, and the cup-carriages fixed. They are twenty-eight in number, formed of ⅝-inch steel plates, each bolted to the cup with ¾-inch bolts, fitted with 8-inch cast-iron rollers truly bored, and fitted with 1⅜-inch turned and shouldered pins.

The side sheets were sent in squares of four, 10 ft. 9 in. by 6 ft. 4 in. After the first square of sheets had been riveted up all round, the vertical stays were next bolted up temporarily, and afterwards riveted up. Props were placed at frequent intervals from the crown of the holder round the shell, to prevent buckling. There are twenty-eight vertical stays, of 6 in. by 2½ in. by $\frac{7}{16}$ in. channel, extending 7 inches below the cup. The bolts fixing the stays were next taken out one by one, and riveted with two ½-inch pan-head rivets in each sheet—$\frac{3}{16}$-inch packing being placed between the stays and the sheets before riveting.

The shell was next lowered by means of fourteen strong screws, 7 feet long by 2½ inches, fixed on wooden battens, with a nut and washer at the top. At the bottom of the screws were fixed chains and straps secured to the cup. Each screw was fixed opposite each standard. A chalk mark was made on one side of each nut, and a man stationed at each screw for lowering, At a signal from the foreman, each man gave his nut one complete turn; and in this way the work of erecting, riveting, and lowering was proceeded with until the shell was completed.

The intermediate sheets are riveted with ¼-inch rivets, 1-inch pitch. In the dip, bolted with ¾-inch bolts at equal distances apart, are cast-iron dip-rests 6 inches long by 3½ inches deep. The dip-carriages were not fixed until later. Between all the sheet-joints was inserted linen tape, previously saturated in red lead and boiled oil.

The fourteen bottom carriages were removed from the cup of the inner lift, and altered to suit the new shell. All the holes in the cup where the carriages had been secured were made-good with bolts.

The outer lift was dealt with in a similar manner to the middle lift. It is 98 ft. ½ in. in diameter by 28 feet deep, and has a circumference of 308 feet. The bottom curb consists of two curbs of of angle steel, 4 in. by 4 in. by $\frac{7}{16}$ in., placed 12 inches apart, jointed with angle plates 18 inches long. The dip is similar to the middle-lift dip. The top and bottom rows of side plates are $\frac{3}{16}$ inch thick, riveted with ⅜-inch rivets, 1¼ inches pitch. The intermediate sheets are 13 S.W.G., riveted with ¼-inch rivets, 1 inch pitch. The dip-carriages are the same as for the middle lift, but shorter in the jaws. There are fourteen bottom carriages, formed of ½-inch plates, each bolted to the top and bottom flanges of the bottom curb with four ¾-inch bolts. Each carriage is fitted with a cast-iron roller, truly bored, and with a cast-steel bush and 1¼-inch steel axles.

The cup-carriages and the top rollers were next fixed, but not adjusted at the time to fit tightly to the channel-guides on the standards. This was done afterwards, as the standards had to be made plumb.

After the contract had been given for the work, it was decided to use an improved form of dip-carriage for the middle and outer dips, with turned shouldered pins for the rollers, and having internal lubrication by means of Stauffer's lubricators and adjusting rods. Also the present rollers on the top carriages were to be provided and fitted with Stauffer's lubricators tapped into each boss.

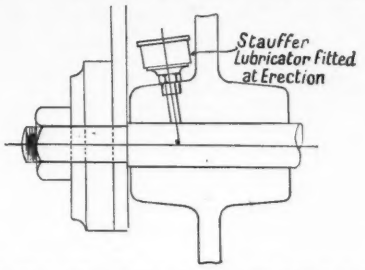
External Guide-Framing.

The standards, which are formed of 14 in. by 6 in. by 46 lbs. per foot rolled steel joists 31 feet high, had to be lengthened by 30 ft. 8 in., making a total height from tank-coping to top row of new girders of 61 ft. 8 in. The standards are jointed with $\frac{7}{16}$-inch joint-covers on the back web, with ¾-inch bolts. The upper end has $\frac{7}{16}$-inch back junction-plates, and is attached to the upper platform (described later) with 3 in. by 3 in. by $\frac{7}{16}$ in. angle steel. On the inside flange of each standard is fixed a steel channel 6 in. by 3 in. by ½ in., riveted with ¾-inch countersunk rivets, 12 inches pitch, zig-zag, similar to the existing guides.

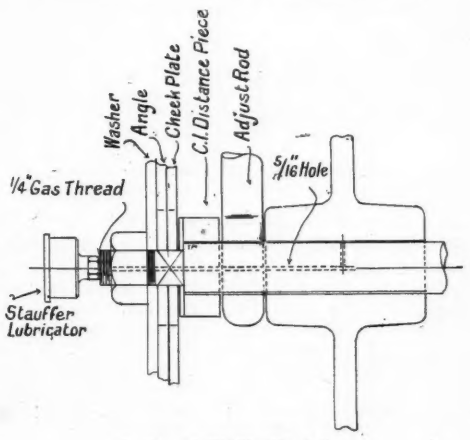
The bell-mouth castings were, of course, removed from the top of the existing standards and refixed at the top of the new lengths.

Girders.

One new row of girders was erected, formed of rolled steel joists 8 in. by 6 in. by 34 lbs. per foot, secured at each end to back plates and to the web of the standards with $\frac{7}{16}$-inch flanged gusset-plates, bolted with ¾-inch bolts. On the top side of the girders is riveted a $\frac{5}{16}$-inch chequer plate, 2 feet wide, forming a platform.



Section of Top Carriage Axle, with Lubricator.



Section of Middle Dip Axles.

On the upper edge of the plate is riveted a lattice girder 2 ft. 9in. deep and 2½ in. by 2½ in. by $\frac{5}{16}$ in. angles top and bottom, and 2 in. by $\frac{5}{16}$ in. lattices, and secured at the standards by means of top gusset-plates 3 feet long by 2 feet wide by $\frac{5}{16}$-inch thick, and to which are secured the bell-mouth castings. The top bar of the handrail is also finished off with hard wood, well secured thereto.

Diagonals.

The standards and girders are further braced diagonally with 6 in. by 5 in. rolled steel joists, secured at the outer ends to back junction-plates, and at the centre with $\frac{7}{16}$-inch crossing plates and ¾-inch bolts.

The new standards, girders, and diagonals were hoisted to the top of the existing standards by means of a derrick travelling on rails. This was accomplished without mishap of any kind.

Ladder.

The existing ladder was extended to 3 feet above the new girder. The sides were formed, as with the existing ladder, of 3 in. by ½ in. flat, and treads of ¾-inch round steel, riveted into the sides and secured to the girders in a similar manner to the present one.

Painting.

The contractors were required to have the whole of the sheets dipped in hot boiled linseed oil before any rust had time to deposit. These sheets, with all steel work, were to be painted with a coat of red oxide paint before leaving the contractors' works. The whole of the seams inside the middle and outer lifts were painted with red and white lead paint during erection. A final coat of red oxide paint was given all over the outside on completion, including the existing holder and framing.

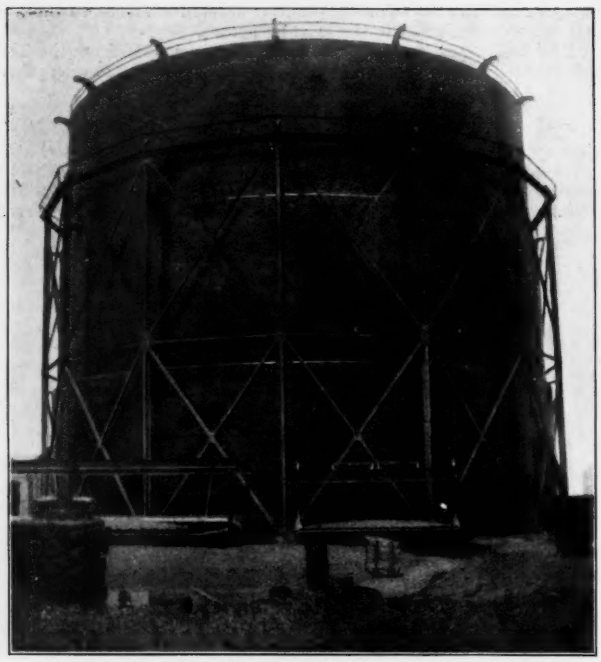
Materials.

The whole of the materials were the best of their kind. The

steel was specified to stand a tensile strain of 26 to 30 tons per square inch, with an extension of 20 per cent. in 8 inches.

During the time the tank was empty, we availed ourselves of the opportunity to clean out of the bottom an accumulation of mud, &c. Several leakages were discovered in the tank-walls and dumpling. These were caulked, and afterwards cemented over with neat portland cement.

The tank was refilled with water from the well by means of the "Pulsometer" before mentioned. Sawdust was sprinkled freely into the tank during the time it was filling.



The Gasholder Completed.

Testing, Guarantee, &c.

The contractors inflated the holder to its full height twice by means of air. All seams were brushed over with soap and water, and any leakages at once caulked. But I am pleased to say that, in consequence of the care taken in erecting, there were only very small leakages found; and the sheets were free from buckles, owing to the frequent use of the props in erecting. The existing standards were made plumb; so that the gasholder, in rising and descending, is not more than ½ inch out of the level. The holder throws the following pressures: Inner lift, 40-10ths; inner and middle lifts, 61-10ths; the three lifts, 79-10ths.

The contractors were required to enter into an agreement to complete the work in two months, subject to a penalty, and leave the gasholder in perfect working order. They were given the contract for the work at the fall of last year; so that they had time to prepare all the materials, and also were able to work during the slack time of the year. The job was finished within the specified time. The contractors were required to guarantee the work for twelve months after completion, and to maintain and repair same during that time.

DISCUSSION.

The President (Mr. D. J. Winslow, Lea Bridge) remarked that the paper was a valuable one, and gave them details in a plain and straightforward manner. Considering that gas undertakings had been, and were still, on the upward grade, and were always increasing their outputs, it was essential to add from time to time to the storage accommodation. Evidently the Company Mr. Vanner was with had this fact in mind when erecting the gasholder and leaving sufficient room for the extra lifts.

Mr. J. G. Clark (Gaslight and Coke Company) remarked that in the beginning of his paper the author pointed out that it was not the lot of all juniors to have had experience in gasholder erection or enlargement. This was true; for it was not the sort of thing that had to be done every day. As to the crown plates being radial, he wondered whether it would not be easier to use rectangular plates. In this way they would have one uniform plate, whereas with the radial principle it was necessary to cut templates of various sorts. The author remarked that when carrying out the extension the existing standards were made plumb. How was this accomplished?

Mr. A. S. D. Ponçon (South Metropolitan Gas Company) asked for some more information as to the method adopted for stopping leakages in the tank and the dumpling.

Mr. D. C. Cross (Lea Bridge) thought it was very difficult to say anything about this holder, as everything had been done so nicely. At his own works, they had also had experience of putting extra lifts to existing holders, &c.; and there were one or two points in connection with the work that he might mention. One of these holders was a small water-gas relief holder of one lift, which was converted to a spiral-guided holder; and when they came to pump out the water, they found 7 feet of pure water-gas tar, with only ½ per cent. of water. This, no doubt, was very exceptional. Another holder of one lift, identical in size with the one now under consideration, was made into a three-lift holder. They were, however, not so fortunate with the columns, which were obsolete; and they had to have them down. The tank was an iron one; and when the water was taken out of it, they found the bottom began to rise, and it was necessary very quickly to weight the bottom of the tank, to prevent the water bursting it. The third holder had an annular tank; and this was very easily dealt with. When a flat-bottomed tank was in question, one had to be very careful to see that the pressure of the water at the bottom did not cause cracks and leaks.

Mr. J. Hewett (South Metropolitan Gas Company) thought it would be interesting to know when the original holder was put up, as there seemed to have been so little trouble in enlarging it.

Mr. Clark raised the question of anti-freezers.

The President said the author mentioned that every gas undertaking should have storage capacity equal to the heaviest output in 24 hours. This would no doubt be the ideal, but it was not every concern that could afford to have this maximum capacity. In other words, the demand increased so rapidly that it soon outstripped the proportion of storage capacity. He did not know whether Mr. Vanner had carburetted water gas on his works; but, of course, one of the great benefits of water gas was the saving it permitted on holder capacity, as the sets could be put to work so quickly. Thus if one found the stock of gas was diminishing rapidly, there was a ready and easy means at hand of meeting the demand. A good many engineers were convinced that a small percentage of water gas had no appreciable effect on the district. He believed Mr. Cross mentioned at the October meeting of the Association that he found a slight variation in composition had, at most, only a very small effect upon the consumers' appliances. Carburetted water gas was a great help to many gas undertakings, as it enabled them to have, he believed, from 70 to 80 per cent. of the maximum day's output in storage capacity. He understood the holder in question was built in the first place with the inner lift of the present holder, leaving sufficient room between the tank and the cup for the two other lifts just put in. He took it that the cup was left at the bottom of the first lift, ready for the time when the middle and outer lifts should be added. Then, again, he thought there was something new in Stauffer's lubricators being used on the rollers. Did the author know of any other holders on which they were used at present? Evidently there were good reasons for fitting them there.

Mr. Vanner, in reply, said he would deal with the President's queries first. Of course, if one had storage capacity equal to the 24-hours maximum make, this would cope with almost any emergency; but on larger works he knew that this could not always be realized, and a carburetted water-gas plant was a great help. At his works they had no such plant; their gas being all straight coal gas. With reference to the inner lift, this was built first in the tank, and the cup was fixed ready for the enlargement. The only alteration that had to be made when the middle and outer lifts were added, was that the jaws of the cup had to be shortened. They took out the jaws of the existing cup, and refitted new ones. Stauffer's lubricators were not a customary thing with old gasholders; but he believed all new ones would have these lubricators fitted to them. It seemed to him it must be obvious that, if the axles of the rollers were well lubricated, there could not be much friction in running up and down the standards. Before the holder was enlarged, when they had only the inner lift, it was found in some cases that the axles on the top carriages had set hard, and the rollers were not revolving at all. In other instances, the axles of the rollers, instead of being circular, had worn elliptical through not having lubrication. He could not state positively when the holder was originally erected—whether in 1897 or 1898—because it was before he went to the works. The experiences quoted by Mr. Cross were rather interesting. In his own case, however, when the water was emptied out there was no deposit at all, except an accumulation of mud, in the bottom of the tank. He had been asked as to the stopping of leakages in the dumpling and sides of the tank. They adopted the method of caulking with yarn, and then made good with neat portland cement. This was found quite satisfactory; time being allowed for the cement to set hard before the water was put in. To deal with small leaks, sawdust was sprinkled freely into the tank during the time it was filling, so that it might percolate into any small crevices. An anti-freezer was not stipulated for in the specification; neither was one at present fixed. It was, however, proposed to have one. In fact, they had started to put in an arrangement which he thought would prove quite satisfactory. An anti-freezer was, of course, quite an easy thing to fix. It was not difficult to make the existing standards plumb. First of all, a plumb-line was dropped from the top of each standard, and they ascertained how much it was out at the top, centre, and bottom. Then by releasing the four holding-down bolts in the base of each column, they were able to shift the standard over by means of jacks. There was sufficient space in the base-plates to allow of this being properly done. Cement grouting was run down, and the standards were left like that. Thus when it was necessary to re-plumb them, when the two lifts were added, it could be accomplished without trouble. Of course, it would have been difficult

if the holding-down bolts had been ground in. The shape of the crown plates was in accordance with general practice; and he thought that the radial principle was adopted on the ground of affording greater strength to meet the stress.

Mr. CLARK proposed a hearty vote of thanks to Mr. Vanner for having brought before the Association a somewhat uncommon subject.

The HON. SECRETARY (Mr. Ernest Scears, of Hampton Court), in seconding, remarked that the building of a holder for a small, or comparatively small, gas undertaking meant a very big draw on the capital account; and the paper just submitted to them emphasized the wisdom of, wherever possible, putting in one lift first, and then completing the job subsequently when the increased demand called for it. In the matter of storage capacity, of course, as already pointed out, undertakings possessing water-gas plants were at a great advantage.

The vote was heartily accorded.

ALLOWED STRAINS IN GASHOLDER DESIGNS.

At the Annual Meeting of the American Gas Institute, the following report by the Committee on this subject was submitted by Mr. V. L. ELBERT, the Chairman.

We recommend that holders be divided into two classes—A and B; class A to include all holders up to 1,000,000 cubic feet capacity inclusive, and class B to include holders above 1,000,000 cubic feet capacity. In the opinion of the Committee, the matter of standardization of holder specifications, in order to prove of general advantage and usefulness, should cover the following points:

(*a*) Maximum allowable unit stresses for each kind of material to be used.

(*b*) Uniform assumptions of loads and the deduced maximum stress in the principal elements of the holder.

(*c*) Kinds and grades of material.

(*d*) General Construction. Minimum thickness and sizes of material (by gauge or unit weight) as determined by purely practical considerations.

(*e*) Average diameter for standard size holders.

(*f*) Duties of contractor and purchaser.

(*A*) MAXIMUM ALLOWABLE UNIT STRESSES FOR EACH KIND OF MATERIAL TO BE USED.

1.—Flange steel..... pounds per sq. in. working stress.
2.—Tank steel ..... pounds per sq. in. working stress.
3.—Structurals ..... pounds per sq. in. working stress.
4.—Rivets—single shear ... pounds per sq. in. working stress.
Rivets—double shear... pounds per sq. in. working stress.

(*B*) UNIFORM ASSUMPTIONS OF LOADS AND DEDUCED MAXIMUM STRESS IN PRINCIPAL ELEMENTS OF HOLDER.

1.—Wind Load. The wind load shall be based on a maximum wind velocity of ..... miles per hour, which shall be considered equivalent to a load of ..... pounds per square foot distributed over the vertical cross section of the container.

2.—The snow load shall be ..... pounds per square foot over ..... per cent. of area of the crown, and shall be considered as a concentrated load applied ..... per cent. of the radius of the holder to the leeward of the centre of the crown.

3.—The static water head shall be the height from the water surface:

(*a*) From the centre of tank course in question.

(*b*) From the lower rivet line of tank course.

(*c*) From a point ..... inches above lower rivet line of tank course.

4.—Crown curb. The compression at the crown curb shall be carried by the cross sectional area of the crown curb angle and ..... width of the outer courses of crown sheet and by ..... width of the top course of the container.

5.—The inner lift of storage holders up to ..... feet diameter shall be figured to throw a minimum ..... inches of water column at the ground level for ·50 specific gravity gas.

6.—Do you deem it expedient to attempt establishing a standard table of efficiencies of ordinary riveted joints such as are used in the tanks of holders of these capacities? If so, send your recommendations with reply.

(*C*) KINDS AND GRADES OF MATERIALS.

1.—Flange steel shall be according to the manufacturers' standard specifications, having an ultimate strength of 55,000 to 65,000 lbs. per square inch; elastic limit, not less than one-half the ultimate strength; elongation, 8 inches 25 per cent.; cold and quenched bends, 180 degrees flat on itself without fracture on outside of bent portion; maximum phosphorus, 0·05 per cent.; maximum sulphur, 0·04 per cent.

2.—Tank steel includes those sheets which the steel mill does not test in order to classify them as extra soft fire-box or flange steel, and the physical properties may vary over manufacturers' standard specifications. Tank steel plates may be used for tank bottoms, tank walls, webs of columns, gussets, &c., when figured within the allowable fibre stress figured above.

3.—Structurals. All rolled shapes shall conform to the manufacturers' standard specifications for structural steel having an ultimate strength of 55,000 lbs. to 65,000 lbs. to the square inch. Elastic limit, not less than one-half the ultimate strength. Percentage of elongation is 1,400,000 divided by ultimate strength. Bending test, 180 degrees to a diameter equal to thickness of piece tested without fracture on outside of bent portion.

4.—Sheets. All sheets shall be of blue annealed steel, either of open hearth or Bessemer, and shall be specified by United States standard gauge up to and including No. 8 (thick).

5.—Rivets shall be made of extra soft steel having ultimate strength of 45,000 lbs. to 55,000 lbs. per square inch; elastic limit, not less than one-half ultimate strength; elongation, 28 per cent.; cold and quenched bends, 180 degrees flat on itself without fracture on outside of bent portion.

(*D*-1) MINIMUM THICKNESS AND SIZES OF MATERIAL (BY GAUGE OR UNIT WEIGHT) AS DETERMINED BY PURELY PRACTICAL CONSIDERATIONS.

1.—Tank bottom. Tank plates 3-16ths inch should be used in bottoms of tanks up to ..... cubic feet in diameter; ¼-inch plates of tank steel will be used in bottom of holder above ..... feet in diameter and up to ..... feet in diameter.

2.—In holders up to ..... cubic feet in capacity, nothing less than 3-16th inch plates should be used in the tank sides. In holders above ..... cubic feet, nothing less than ¼ inch should be used in the tank sides.

3.—Container crown. In holders up to ..... feet in diameter, nothing less than No. ..... United States standard gauge shall be used in the crowns; in holders above ..... feet in diameter, nothing less than ..... gauge shall be used in the crown.

4.—Holder side sheets. In holders up to ..... feet in diameter, nothing less than No. ..... United States standard gauge shall be used in the side sheets; in holders above ..... feet in diameter, nothing less than ..... gauge shall be used in the side sheets.

(*a*) In holders up to ..... feet in diameter, nothing less than No. ..... United States gauge sheets shall be used in the cup and grip sheets; in holders above ..... feet in diameter, nothing less than No. ..... United States gauge sheets shall be used in the cup and grip sheets.

5.—The extension of the standards below the tank level (standards supports) shall be .....

(*a*) Sufficient to allow for necessary rivet shearing value and bearing value only, or

(*b*) Shall provide for the above and shall extend ..... per cent. of the way down the tank sides, or

(*c*) Shall extend to the middle of the lower course of tank sides.

6.—For holders up to ..... feet in diameter, radial wind ties shall be used; for holders above ..... feet in diameter, chordal wind ties shall be used. Please state if you prefer to build the guide-framing without the use of any wind-ties whatever.

7.—Gasholders having an inner lift up to ..... feet in diameter need only be provided with a centre pier for supporting the crown.

(*a*) Holders above ..... feet in diameter should be provided with a crown support consisting of a wooden spider frame in addition to the centre pier, and this centre pier should extend to within ..... feet of the crown curb angles.

8.—All holder crowns should be provided with guard rails around the outer circumference, made of one course, or two courses, of ¾ inch or 1 inch wrought-iron pipe. On holders above ..... feet in diameter, the same type of guard rail construction shall be used on the grip channels of each lift.

9.—The grip sheet shall extend ..... inches above the top of the grip channel (which shall be the same size as the cup channel), in order to form a dam sheet to retain the water in cases of high wind, &c.

(*D*-2) MINIMUM THICKNESS AND SIZES OF MATERIAL (BY GAUGE OR UNIT WEIGHT) AS DETERMINED BY PURELY PRACTICAL CONSIDERATIONS.

1.—All sheets should be riveted metal to metal, or have joints made-up with red lead.

2.—The landing blocks should ..... be fastened rigidly to the tank bottom, unless provided with broad chairs to prevent overturning.

3.—The corner of the top curb angle of the container should be level with the top of the walk when the container is landed, or it should extend ..... inches above or below the tank walk. The top of the grip channel of the middle and outer sections should be of the same level, which level shall be ..... inches above or below the top of the container curb angle, or shall be level with the container curb angle when all lifts are landed.

4.—Are there any parts of the holder where bolts may be used—that is, where rivets are not absolutely necessary, such as attaching the vertical to the clips on the inside of the container, and the tank-guides to the clips on the inside of the tank?

(*a*) Should bolted or riveted construction be provided for fastening the bases of the columns to the top of the column support?

5.—All vertical legs coming directly opposite the holder columns shall be provided with ample gusset plates, at the top end of which shall be attached through the outer course of crown sheets to the goose-necks in such a manner as to make a rigid connection between the goose-necks and the vertical legs.

(*a*) The intermediate vertical legs should or need not be attached to the top curb angle and the outer course of crown

sheets and the secondary curb (whenever a secondary curb is required in the construction). The lower end of the vertical legs shall be securely riveted to the bottom course of container side sheets, or the lower end of the vertical leg shall be rigidly framed to the cup channel by means of the bottom roller bracket or necessary angle clips.

6.—The goose-necks at the top of the various lifts shall be made up of plates and rolled sections fitted with cast-iron rollers.

7.—All bottom roller brackets shall be framed of steel plate or steel rolled sections, and the rollers shall be of cast iron.

8.—There shall be one manhole or bonnet, which is easily removable, over each inlet and outlet pipe, and there shall be one additional manhole near the centre of the crown.

9.—There shall be a manhole in the lower course of each section of multiple-lift holders for access between the lifts in repairing.

10.—There shall be one inlet and one outlet pipe, unless otherwise specified.

11.—The size of the drip pipes shall be determined by the size of the inlet and outlet connections, and shall have a capacity to be agreed upon.

12.—The drip-pot in the holder connections for steel tank holders shall have a plug in the top tapped for a 1¼ in. by 2 in. bushing, and shall have a 1¼-inch drip pipe extending to within 1 inch of the bottom of the drip pot.

13.—In masonry tank holders the inlet and outlet risers shall extend to the ground level, and shall be closed with a blank flange having a 5-inch or 6-inch removable flange through which the drip pump may be connected in such a manner that the pump cylinder can be easily removed.

(*E*) Major Dimensions for Standard Size Holders.

1.—The minimum pressure of a holder is that produced by the inner lift. If the total capacity of the holder is to be utilized, would it not be better to standardize the holder on the basis of minimum pressure?.....

2.—The capacity of the holder shall be the capacities of the several lifts; and in determining this total capacity, the capacities of the several lifts shall be taken as follows:

(*a*) Outer lift.—The capacity of the outer lift shall be the volumetric content determined by multiplying the cross sectional area of the outer lift by the distance from the bottom of the bottom curve angle to the bottom of the cup channel of the middle lift.

(*b*) Middle lift.—The capacity of the middle lift shall be the volumetric content determined by multiplying the cross sectional area of the middle lift by the distance from the bottom of the cup channel of the middle lift to the bottom of the cup channel of the inner lift.

(*c*) Inner lift or container.—The capacity of the inner lift or container shall be the volumetric content determined by multiplying the cross sectional area of the inner lift by the distance from the top of the landing beam to a point which shall be below the level of the water in the tank (as determined by the tank overflow adjustment), an amount equal to the pressure in inches of water column thrown by the inner lift or container alone.

(*d*) The contents of the crown of a holder are not taken into consideration as the working capacity of the holder.

Society of Engineers.

The third annual general meeting of the Society was held on Monday last week—Mr. John Kennedy in the chair. The report of the Scrutineers of the postal ballot for the election of Council and Officers for 1913 showed that Mr. Arthur Valon had been elected President; and among other members of the Council were Mr. Percy Griffith and Mr. H. P. Maybury. A Society's premium, value £2 2s., was awarded to Mr. P. J. Waldram, for his paper, entitled "Test Deflections in Reinforced Concrete;" and a resolution was passed thanking the other authors who had presented papers during the year, some of whom, being members of Council, were not eligible to receive premiums.

Herr P. Krais deals, in the "Zeitschrift für Angewandte Chemie," with the fastness to light of pigments made from coal-tar colours. According to an abstract given in the "Journal of the Society of Chemical Industry," the comparison of water-colour pigments obtained from the various coal-tar colours with those from mineral colours has been effected by exposure under comparable conditions for five successive periods of 18, 18, 38, 37, and 221 days respectively. Data are given as to the amount of sunlight as registered by the heliograph, and the number of "bleaching hours" as measured by standard test-papers. The pigments were obtained, in the case of each colouring matter, first from the pure material and then from various mixtures with *blanc fixe*. It is found that the colours which are not fast to light when mixed with *blanc fixe* are also not fast when mixed with other white or coloured substances. It is not necessary that fastness extending to the end of the author's fifth period should be required for pigments used in interior decoration. If the colour is not considerably affected at the end of the third period, it is generally suitable for such work. As a result of examining sixty-three different colours, about forty may be classed as being good; eleven of them being practically as fast as good mineral colours like Victoria green, chrome yellow, &c.

PREPARATION OF THORIUM FROM MONAZITE BY MEANS OF HYPOPHOSPHORIC ACID.

We give an abstract translation of an article on this subject, by Herr Fritz Wirth, which appeared in a recent number of the "Zeitschrift für angewandte Chemie."

As an improvement on existing methods, the author suggests the employment of subphosphoric acid, the thorium salt of which [Th. (P_2O_6). 11 H_2O] is insoluble in acids, water, and alkalies. The subphosphates of the trivalent earths being readily soluble in acids, this salt can be used for the complete separation of thorium from the acid solutions obtained by the "breaking" of monazite sand. Titanium and zirconium are precipitated at the same time as the thorium; but their separation presents little difficulty, and they are not present in great quantities in the monazite. To bring the subphosphate to a convenient form for weighing, it is boiled with a solution of caustic potash for seven or eight hours, filtered several times, and finally the pure hydroxide of thorium is obtained. This is next dissolved in dilute hydrochloric acid, and the thorium precipitated cold by an excess of oxalic acid—the hydroxides often remaining somewhat alkaline. The precipitation as oxalate has the further advantage of purifying the thorium from titanium and zirconium. The subphosphate can equally well be transformed into ordinary phosphate, which is readily soluble in the mineral acids. It is much more soluble than the oxalate. To precipitate the thorium from the acid solution, a large excess of oxalic acid must be used.

If it is desired to separate thorium from a mixture of thorium and rare earths, the solution must contain 15 to 20 per cent. of pure sulphuric acid. A cold solution of di-sodium subphosphate [$NaHPO_3 .3H_2O$] is then added, drop by drop, to the boiling thorium solution. The mixture is well stirred, and the thorium immediately separates out in the form of flakes. After standing for several hours, the precipitate is filtered, washed, and rinsed into a dish by a jet of water acidified with sulphuric acid. The solution is next evaporated to dryness. To oxidize it, 20 cc. of fuming nitric acid and 20 cc. of concentrated sulphuric acid are added, and the mixture evaporated with continuous stirring, in order to drive off the nitric acid. At the end of three-quarters of an hour the oxidation is complete. The contents of the dish, consisting of sulphates and a small amount of phosphate, are poured into a beaker containing 800 cc. of water, which entirely dissolves them. Finally, the whole of the thorium is precipitated in the cold with oxalic acid.

METHODS OF ECONOMIZING HEAT.

The second of the series of Cantor Lectures on this subject now being given by Mr. C. R. Darling at the Royal Society of Arts was delivered on Monday last week. The lecturer commenced with some remarks on heat engines, and pointed out that in steam-engines only 16 per cent. of the heat of the fuel employed is converted into work; 14 per cent. being lost by radiation, 10 per cent. by the flue, and 60 per cent. by the condenser. These losses of heat are unavoidable. In internal combustion engines, 30 per cent. of the heat is converted into work, 25 per cent. is lost in the cooling water and by radiation, and 45 per cent. in the waste gases. But against the gain in heat utilization compared with the steam-engine, must be set the higher cost of the fuel. The lecturer thought the gas-engine was not likely to displace the steam-engine for large power purposes. He explained that the difference between the two motors, as regards the amount of heat converted into work, was to be found in the fall of temperature in working. The initial temperature in the gas-engine cylinder was 1500° C.; in that of the steam-engine, 350° to 400° C.

In the course of the lecture, reference was made to schemes for the centralized generation of power at the coalfields and its distribution on an extensive scale, such as those proposed by M. Ferranti, and more recently by Sir William Ramsay. Mr. Darling thought there was no likelihood of such schemes being adopted; one drawback being that in the event of a strike at the central source of power the industries receiving supplies would be paralyzed. Though separate units were more wasteful of energy than concentrated ones, they possessed many advantages.

A specially interesting portion of the lecture was that in which the escape of heat from hot surfaces was dealt with, and the value of insulating materials demonstrated. A calculation had been made which showed that a loss equal to 3d. an hour, or £90 for a year of 7200 working hours, owing to the radiation of heat, might be saved to the extent of at least 50 per cent. by proper insulation. The higher the working temperature, the greater was the loss by radiation; and the lecturer suggested that much more attention should be paid to furnace insulation. He described the various methods adopted for lagging steam-pipes, boilers, and furnaces, and put the saving effected by the use of insulating material at 75 per cent. if 0·5 inch, and 50 per cent. if 0·33 inch. He considered 1½ inches should be the thickness. Ordinary building brick was probably the best insulator; and after it came fire-brick. Dick's antithermic bricks had been found useful in conserving the heat in settings of gas-retorts. Vacuum was the best insulator; but, of course, it could not be used on a large scale. An adaptation of Professor Dewar's vacuum bottle

(one of which was shown) was already on the market as a commercial article; and it might be hoped that vacuum—which was described as "the acme of insulation"—might be still further extended.

Last night's lecture, which concluded the series, was devoted to the subject of domestic heating.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The members of the Eastern District Division of the Scottish Junior Gas Association had an interesting outing last Saturday afternoon, when a visit was paid to the chemical works of Messrs. Alexander Cross and Sons, Limited, at Camelon, Falkirk. The works are situated about a mile from the centre of the burgh, and an immense business is done in the manufacture of cakes for feeding cattle, sulphuric acid, chemical manures, and slag. They cover about two acres of ground, and have the facilities for loading purposes by railway sidings and canal.

The members of the Association numbered about twenty; and they were accompanied by Mr. Alex. Bishop (President), Mr. John A. Moyes (ex-President), and Mr. Laurance Farquhar (Secretary). They were received by Mr. William Colquhoun, the Works Manager, who, with Mr. Charles Haddon, the Chemist, and Mr. A. M'Culloch, the Assistant-Chemist, conducted them over the various departments. The visitors were first shown the method of making sulphuric acid from Thorsus sulphur ore by the usual chamber process—namely, three chambers and one Glover and one Gay Lussac tower. They also inspected the plant working on the intensive principle, using two Gay Lussac towers and forced draught, with water-sprays in place of steam. The sulphur ore is burnt to sulphur dioxide, and passed up into a flue where it is joined by nitrous oxides generated from sodium nitrate and sulphuric acid. These gases, along with oxygen drawn from the air, pass up the Glover tower, where they are met by a stream of cold acid containing nitrous compounds and weak sulphuric acid. The gases, being hot, denitrate and concentrate the stream of acid, and pass with the nitrates derived from the acid into the first chamber, where they are supplied with steam, and sulphuric acid is formed which drops to the bottom of the chamber. The same action takes place in the other chambers; leaving only nitrous compounds which have acted as catalytic agents. These gases pass up the Gay Lussac tower, where they are met by a stream of cold acid which absorbs them. The acid is the same as that which is run down the Glover tower, and gives off its nitrous compounds to go again through the chambers to help the sulphur oxygen and water to form sulphuric acid. In the intensive process plant, the only difference is that cold water is put into the chambers in the form of very fine spray instead of steam; and the gases, after passing up the Gay Lussac tower, are forced by a fan to ascend a second tower, for the removal of the last traces of nitrous compounds. This is necessary, as with the same size of plant twice as much sulphur is burned, and double the quantity of sulphuric acid made. In the chemical manure department, the party viewed the slag-mills, grinding-mills, dissolving-pans, pulverizing-machines, &c. In the cake-mill, they had an opportunity of seeing the process of manufacturing feeding-cakes, and the working of the presses for producing "Camelon" feeding and fattening cakes. The visitors were also privileged to see the new electric and motor power which Messrs. Cross have just installed at great expense.

Every department of this gigantic business undertaking was carefully explained by Mr. Colquhoun, Mr. Haddon, and Mr. M'Culloch; and much valuable information was conveyed in a careful and intelligent manner—the various processes of manufacture bringing vividly before the members the inner methods of one of the most important concerns in Scotland.

When the party had concluded their tour of the works, they assembled in the laboratory, where Mr. Bishop briefly conveyed the thanks of the Association to Messrs. Cross for their kindness in affording the members the opportunity of inspecting the works. He stated that what they had seen had been very interesting, and he was sure what they had learned would be of use to them all in future.

Mr. Colquhoun expressed his pleasure at having been of service to the members, and assured them that the firm would be delighted to hear that they had enjoyed their visit to the works.

Bedford Water-Works Extensions.—Last Wednesday, extensions of the water-works at Bedford which have been carried out at the suggestion of the Local Government Board were formally opened by the Mayor (Mr. H. Browning) and the Chairman of the Water Committee (Mr. Joseph Miller). The new works comprise a service reservoir and revolving filters; and they have been carried out under the supervision of Major Tulloch as Consulting Engineer and Mr. Storey as Resident Engineer.

Forthcoming New Issues of Gas and Water Capital.—The sale conducted by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, E.C., last Tuesday, the results of which are given elsewhere, was the last for the present year. They will resume on the 21st prox., when they will be issuing new capital for the Sheringham Gas and Water Company, the Great Yarmouth Water-Works Company, and the Southend Water Company, as well as offering for sale other gas and water stocks and shares.

REGISTER OF PATENTS.

Separation of Sulphur from Sulphuretted Hydrogen and Gases Containing It.

FRITZSCHE, P., of Recklinghausen, Germany.

No. 25,454; Nov. 15, 1911.

This invention relates to the production of sulphur from the action on each other of sulphurous acid and sulphuretted hydrogen; the main feature of the process being that the two gases are treated simultaneously or in succession by a liquid in which aluminium hydrate or an aluminium compound of similar action—*e.g.*, basic aluminium sulphite—is contained in suspension or solution.

The details of the process are arranged in dependence on the composition of the gases from which the sulphuretted hydrogen is to be extracted by the treatment with aluminium sulphite. If the gas or gas mixture has no constituent other than the sulphuretted hydrogen, which reacts with aluminium sulphite, the gas is washed with the sulphite solution—sufficient of the latter being used that the washed gas is just free from sulphuretted hydrogen, while the used washing liquid contains only a small quantity of undecomposed aluminium sulphite. The treatment is carried out preferably at a temperature of 60° to 70° C. The solution then contains, according to the original concentration, a greater or smaller amount of aluminium pentathionate, which decomposes into aluminium hydrate and much sulphur when the solution is heated or treated with excess of sulphuretted hydrogen. To precipitate nearly all the alumina, it is preferable to treat the solution which was used in the first washer to decompose the sulphuretted hydrogen in a second washer with sulphuretted hydrogen or gases containing it, until it is saturated therewith.

The washing liquor, with all the suspended deposit therein, is then again brought into the apparatus in which the saturation of the liquor containing the aluminium hydrate took place at the beginning of the operations, and sulphurous acid is again passed through. The alumina compounds pass into solution, and only the sulphur remains undissolved. After the sulphur has been separated from the regenerated aluminium sulphite solution by decantation or filtration, or these processes combined, the solution is ready for the washing of fresh quantities of gas. The sulphur is washed and dried, and part of it can be used for the generation of the sulphurous acid required by the process; the rest being available for other purposes.

If the gas which is to be purified by aluminium sulphite contains, in addition to sulphuretted hydrogen, other constituents which react with the sulphite solution, these can be either previously removed from the gas and the latter freed from sulphuretted hydrogen in the manner described, or all can be washed out together. For example, if the gas contains ammonia, this can be removed by washing the gas as usual in an acid or in a solution of a salt which is decomposed by ammonia—say, aluminium sulphate. If the ammonia and the sulphuretted hydrogen are to be simultaneously washed out of the gas, then sufficient washing liquor must be used to decompose the sulphuretted hydrogen and combine the ammonia present, by means of the sulphurous acid in the liquor.

The washing can be carried out in the usual apparatus—*e.g.*, towers—care being taken that the filling material does not allow the substances being separated out to collect on horizontal surfaces. Further, the solutions of aluminium sulphite should not be very concentrated, as, if so, the liquor, would have a somewhat pulpy nature—of considerable inconvenience in the further treatment. The temperature favourable for the process (60° to 70° C.) can be obtained in this case by blowing in ammoniacal vapours from an ammonia water distilling apparatus or other vapours.

If the ammonia and the sulphuretted hydrogen are to be simultaneously washed out, the washing liquor is subjected to a two-fold decomposition. In the first place, sulphur and basic aluminium sulphite are formed; and in the second place, aluminium hydrate, ammonium sulphite, and ammonium polythionate. Accordingly, the liquor discharged from the washing apparatus contains, in addition to the dissolved subtances, sulphur, aluminium hydrate, and basic aluminium sulphite in suspension.

If ammonia is to be obtained in the form of sulphite, it is only necessary to separate the solution from the deposit and concentrate the former by evaporation until the salt is separated out. The precipitate is washed in fresh water and the alumina compounds brought into solution by treating with sulphurous acid, as previously described. The solution can be used again as washing liquor after the removal of the remaining sulphur.

If the ammonia contained in the solution is desired in the form of sulphate, this can be effected by treating the solution with oxygen or air, preferably in the presence of the alumina compounds, which favour the oxidation of the sulphite to sulphate. The tendency of alumina to form alums (ammonia alum) comes into play here. The oxidation is best carried out at high temperature by means of air in "apparatus permitting the fullest utilization of hot air for the purpose of oxidation"—closed apparatus inside which the liquor is brought into intimate contact with the air passing through, by means of stirring vanes. It is only when the oxidation is to be combined with concentration of the solution that it is advisable to merely blow the air through the solution.

It is naturally unnecessary at the time, the patentee remarks, to separate all the solution present from the precipitate in order to evaporate it. For a continuous process, it is preferable to concentrate the ammonia solution to a certain amount by using it repeatedly for the washing and again saturating with sulphurous acid, without previously removing the precipitate. The precipitate is then separated from an amount of solution corresponding only to the daily increase in ammonia, and this amount evaporated to sulphate. The alumina precipitate (separated from the solution by centrifugalization, filtration, or otherwise) is placed in fresh water and thus added to the main bulk of the unfiltered liquor. The united liquors are to be re-saturated with sulphurous acid and their treatment continued as already described.

If the liquor is increased in quantity during the process, only so much filtered liquor is removed as corresponds to the increase. The filtered-off precipitate is again distributed in the main bulk of the unfiltered liquor, saturated with sulphurous acid, and, after removal of the sulphur in suspension brought in by the unfiltered part of the liquor, the solution is again used for washing the gas.

The same purpose—*i.e.*, of combining the purifying of the gas from sulphuretted hydrogen and the obtaining of ammonium sulphate—can be carried out in the following manner in the case of coal distillation gases. The gas containing ammonia, before it arrives in the washing apparatus in which the sulphuretted hydrogen is to be removed, is washed with a solution of aluminium sulphate. Aluminium hydrate is thereby precipitated, and ammonium sulphate remains in solution. The washing liquor, along with the precipitate, is brought into an apparatus in which it is treated with sulphurous acid until all the aluminium hydrate is dissolved. This solution serves as washing liquor for the purification apparatus in which the removal of the sulphuretted hydrogen takes place. The solution is used in considerable excess; so that a part of the sulphurous acid is removed from it by the sulphuretted hydrogen—the greater portion remaining dissolved as aluminium sulphite. The solution now passes directly into the oxidizing apparatus, where it is treated with air until the sulphite is converted into sulphate. At the same time any polythionates present are decomposed and converted into sulphate; sulphur being separated out. The sulphur suspended in the solution is removed by filtration or decantation, or a combination of the two. The solution is then suitable for washing the ammoniacal gas, like the originally-used solution of aluminium sulphate. The cycle of changes of the aluminium sulphate solution then recommences.

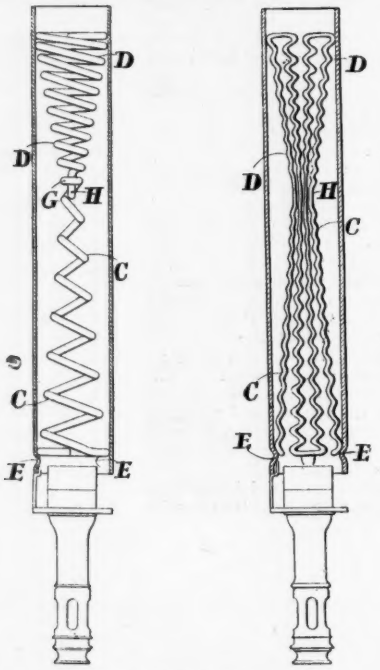
In this case, also, it is preferable not to completely remove the ammonium sulphate solution from the operations and evaporate it in order to obtain the salt as a solid. It is better to enrich the solution by repeated precipitation and ensuing saturation with sulphurous acid, until it contains so much ammonium sulphate that as little water as possible has to be evaporated. The amount of solution freed from alumina and passed to the evaporating apparatus will then be only the equivalent of the daily increment of ammonia. The alumina filtered from this portion of the solution is then brought into suspension in the main bulk of the liquor which was not filtered, and only enough fresh water added as required to obtain the originally existing cencentration of aluminium sulphite.

Gas Radiators, Stoves, &c.

WALKER, A. B., of Wallsend-on-Tyne.

No. 26,951; Dec. 1, 1911.

According to one way of carrying this invention into practice, a bunsen burner is employed which gives a flame fitting the burner with a chimney of suitable length made of fused silica. Within the chimney is arranged a spiral coil, also made of fused silica and more or less of the shape of two cones in alignment with their apices abutting. In use, there is in the coil next to the burner a zone of very high temperature "in which practically perfect combustion takes place, and the chimney and coil radiate a large amount of heat."



Walker's Silica Gas-Radiators.

Referring to the first arrangement shown, the radiating element within the chimney is preferably formed of two parts—a lower tapered spiral or helix C of fused silica tubing so shaped as to conform as nearly as possible to the contour of the flame of the burner, and an upper oppositely disposed or inverted conical or tapered spiral or helix D (also of fused silica), attached to, or forming a continuation of, the lower spiral and acting as a regenerator "to utilize the heat of the products of combustion and convert it into radiant heat." The spiral D is the form preferred, since it has been found by experiment that it "gives the best combination of regeneration and effective radiation" and "secures that the heat is chiefly concentrated on the outside of the coils, where it is most effective for the purpose of radiation." The tubular form of the spiral, it is said, provides a relatively large radiating surface with a comparatively small mass; so that a high temperature is obtained. It also has the advantage of giving the freest possible passage to the flame and the combustion products, and thus "ensures complete combustion, and consequent absence of smell."

The lower spiral C may rest on protuberances E on the inner surface of the chimney, and the upper spiral D may be supported on the lower spiral, being provided with an extension F, which projects through an eye G at the apex of the lower spiral and keeps the latter perpendicular.

In the second arrangement shown, double cones C D, of silica tubing, are bent zig-zag, so as to form a double cone-shaped skeleton of vertical members bent inwardly at H so as to form a waist at about the centre of their length. The element D may be further provided with inwardly extending projections "to assist in trapping the heat of the products of combustion, provided that such portions or projections are not sufficient to unduly impede the flow of the gases."

Moving the Lower Doors of Vertical Retorts.

GUMZ, L., of Berlin.

No. 11,717; May 16, 1912. Convention date, Oct. 18, 1911.

This invention relates to a device for opening or closing the lower doors of vertical retorts or of the chambers of chamber-furnaces or ovens by means of toothed wheels and a common sliding rack-bar, arranged so as to be capable of turning, and provided with as many relatively displaced racks as there are door-controlling shafts with toothed wheels fixed thereon, so that there is always only one door-controlling shaft in engagement with the sliding shaft. [An illustrated account of this invention appeared in the "JOURNAL" for Nov. 19, p. 580.]

Recovering Carbon Bisulphide from Substances Containing It.

ILLINGWORTH, S. R., of West Ham, and the GAS LIGHTING IMPROVEMENT COMPANY, LIMITED, of Salisbury House, E.C.

No. 15,777; July 5, 1912.

According to this invention, the carbon bisulphide contained in liquid and solid substances which are non-miscible with, or insoluble in, water is treated with a mixture of alcohol and an alkali; the resultant salt of the alkyl sulpho-thiocarbonic acid is washed out together with any uncombined alcohol that may be present; and the wash water is treated with an acid—the carbon bisulphide being separated from the mixture and, if desired, the alcohol recovered from the residue.

The process may be illustrated by its application to the recovery of carbon bisulphide from benzol. For this purpose, the benzol containing the carbon bisulphide, after any adhering water has been separated from it, is treated with a suitable amount of alcoholic potash to convert the carbon bisulphide present into potassium xanthate. When the reaction is complete, just sufficient water is added to dissolve the solid potassium xanthate and any uncombined alcohol that may be present. The whole is then left to stand, whereupon it separates into two layers—the upper consisting of the benzol and the lower one of an aqueous solution of potassium xanthate. The benzol, after separation of the aqueous solution of the xanthate, is washed with a further quantity of water to remove all traces of xanthate, after which it is redistilled. Dilute acid is then cautiously mixed with the lower layer until the whole of the potassium xanthate is decomposed; the temperature being prevented from rising above 70° Fahr. If the mixture be allowed to settle, it will form two layers, of which the lower will consist of crude carbon bisulphide containing sulphur. The upper layer is then neutralized by the addition of an alkaline substance, such as chalk or caustic soda, whereupon the alcohol is recovered from the liquid by distillation. It is essential to have the benzol or other liquid containing the carbon bisulphide as free from moisture as possible. Therefore, any liquid to be treated must be first separated from adhering water, as already mentioned. The final stages of the separation can be effected by agitation with quicklime, or by blowing with warm air.

In an alternative form of the process, the solid xanthate is filtered off by pumping the benzol mixture through a canvas filter. The filtered benzol is then washed with water, and this wash water is used to dissolve the solid xanthate left on the filter. The xanthate solution so obtained is decomposed and treated as described.

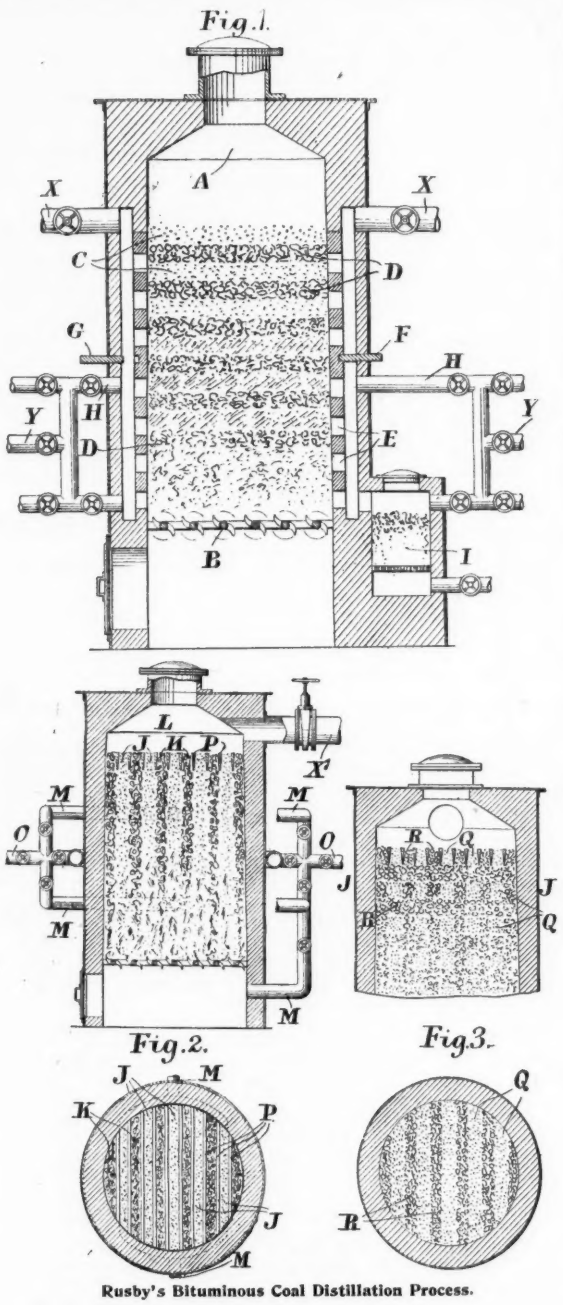
Distilling Bituminous Coal.

GLASGOW, A. G., of Victoria Street, Westminster; a communication from J. M. RUSBY, of Philadelphia, U.S.A.

No. 9292; April 19, 1912.

A description of the process according to this invention is as follows: The bituminous coal (or other carbonaceous matter to be distilled) is disposed in layers or other forms of small transverse section, in immediate contact with, and separated from each other by, layers of refractory (infusible by heat) material, so that the charge, which is composed of the alternate layers, is free to descend; the requisite depth and alternating character of the charge being maintained by the superposition of correspondingly disposed carbonaceous matter and refractory material as the residual material is removed from the bottom. The layers of refractory material are of such kind—preferably moderately finely-divided fragments free from such finer material as would clog their interstices—that they are freely permeable by gases; and they are so disposed as to form, with possible connecting passages, long continuous porous ducts, "which are thus easily traversable by gases throughout their entire length." The provision of these ducts, and their maintenance during the process of distillation, is important, in order to provide for the carrying of air and hot gases through the charge, as explained later. The transverse section of the

ducts is (as already suggested) of such form—for instance, broad and shallow—that all the refractory material forming the duct is either in immediate contact with, or very close to, the carbonaceous material to be distilled, which, as already described, immediately adjoins or surrounds the ducts of refractory material. Heated gases are caused to traverse the ducts of refractory material either continuously or intermittently, according to the nature of the carbonaceous material being distilled and the nature of the products desired to be obtained. These heated gases may be produced by, and introduced into the ducts from, some external source. Preferably, however, the refractory material forming the ducts shall be lumps of coke or "hard" coal (composed almost entirely of fixed carbon, the "most infusible of substances"), and the hot gases be generated by the combustion of a portion of this coke or hard coal, and also by the combustion of a portion, large or small as desired, of the combustible gases and vapours distilled from the surrounding carbonaceous material. These gases and vapours



Rusby's Bituminous Coal Distillation Process.

flow from the carbonaceous material into the ducts; air with or without steam for supporting combustion being supplied into the inlet end of the ducts, and the resulting hot combustion gases flowing through the entire length of the ducts, "thoroughly permeating the refractory material." The heat of the hot combustion gases is imparted to the carbonaceous material in two ways—a portion of the hot gases comes directly into contact with the carbonaceous material, and thus yields up its heat directly and instantaneously; while another portion of the hot gases imparts its heat to the refractory material, whence the heat is radiated and conducted into the carbonaceous material. If the passage of hot gases through the ducts is intermittent, the refractory material will store heat from the hot gases during their flow, and again give the heat out to the carbonaceous material during the period of cessation of flow of the hot gases.

The patentee states: The invention can be practised by means of a variety of apparatus; but forms of apparatus "suitable for its practice will now be described in connection with the invention itself or, more accurately, with illustrative embodiments of the invention."

Fig. 1 is a view, principally in central section, illustrating apparatus in connection with which the invention can be practised in one way. Fig. 2 is a similar view (with section) of apparatus in which the invention can be practised in another way. Fig. 3 illustrates the practice of the invention in yet another way.

In fig. 1, A is a chamber the shape of which is not material, although it is shown rectangular in horizontal cross section. B is a grate device constructed to break the coke into lumps and remove it continuously or intermittently from the bed. C are layers—3 to 6 inches thick in the case of bituminous coal, and in the case of any other material of a thickness dependent upon the nature of the material. The layers are in immediate contact with, and are separated from each other by, layers D of infusible porous material—such as pieces of brick or coke or hard coal. Being thus constituted they are flexible and capable of responding to movements of expansion, contraction, and travel of the bed. Not by way of limitation, but for the sake of description, it will be assumed that coke is employed as the infusible or refractory material. The layers constitute the porous ducts that extend continuously through the fuel. Assuming that the operation has been started, and that it is desired to save the gas distilled from the carbonaceous material, air is introduced through E, and, by reason of the slide or damper F, is caused to traverse the lower strata or layers or ducts D, so that combustion takes place and the material in the ducts is heated. The slide G is open, and secondary air can be admitted at H, so that further combustion taking place in the upper ducts D serves to preheat the oncoming charge of fuel and ducts. The products of combustion pass out at X. The air can then be shut off, and the distillation of the carbonaceous material continues by reason of the heat stored in the substance which forms the ducts; while the distilled gas and vapours are led off through the off-take connections X or Y by way of the ducts D. These operations may from time to time be conducted from opposite sides of the apparatus, the fittings of which are duplicates. As the process continues, the layers of carbonaceous material are converted into coke, so that at the bottom there is coke of which some originally constituted the ducts and the rest was derived from the carbonaceous material, and the coke which is thus quickly made can be used in re-charging the apparatus along with fresh carbonaceous material in the manner described—that is to say, in such a way that porous ducts are provided. In starting, the contents of the chamber may be heated by the introduction of hot gases from the auxiliary producer or generator I, or in any convenient manner.

Reference has been made to the stratification of the carbonaceous material and to the ducts as being horizontal. As shown in fig. 2, the stratification is vertical, and here the point is that the bed shall be subdivided by movable porous ducts which extend through it and which are substantially continuous, so that they afford passages for hot gases and vapours, with the result that distillation takes place throughout the bed by the direct application of heat as distinguished from the use of impervious retorts or immovable and rigid or fixed devices.

In fig. 2, J indicates the subdivisions, layers, or strata of the carbonaceous material, and K are the porous ducts. The receptacle L may be of circular horizontal cross section, and the air (with or without steam) and gas may be conducted through the pipe M by means of the connections N, for the air, and O for the gas which is distilled. X^1 is the off-take for products of combustion. In general, the method as practised in connection with the apparatus of fig. 2 is the same as has been described, and the process may be started by introducing hot gas or air and combustible gas as described in connection with fig. 1.

In connection with fig. 1, the material can be easily charged in horizontal layers, and in fig. 2, in order to charge the material in vertical or upright layers, use may be made of a charger consisting of suitably-supported partitions P. The space between the partitions may be narrower at the top than at the bottom, to facilitate the passage of material. The material for the ducts is charged in alternate spaces between the partitions, and the carbonaceous material is charged in the remaining spaces between adjacent partitions. It is possible when the charger is circular to rotate it through 90° every once in a while; and when this is done, the layers are arranged so as to break-joint while maintaining continuous ducts. The result of this is shown in fig. 3, in which Q is the carbonaceous material and R are the porous ducts.

By way of explanation, it is stated by the patentee that the invention is applicable for distilling carbonaceous materials of such quality that they are practically incombustible until partly coked or carbonized, and of such quality that when heated they tend to melt and run together, forming a mass through which air cannot be passed successfully, as by blasting or the like, and of a quality which may expand or contract unduly when carbonized. By the invention, such carbonaceous materials are converted into an excellent quality of coke in a cheap and, if desired, small apparatus in any quantity required, and more rapidly and expeditiously than by means of elaborate and expensive apparatus of large size. Such carbonaceous materials can thus be utilized for producing coke, and from the coke fuel or water gas can be made, so that, as a result, "fuel or water gas can be made from carbonaceous materials which were hitherto utterly unsuited for the purpose, as it would not repay an ordinary gas-works to instal such expensive coke-ovens and devices as were hitherto required for treating the qualities of coal in question."

Gas Measuring Instruments of the Wet Meter Type.

ARON, H., of Berlin.

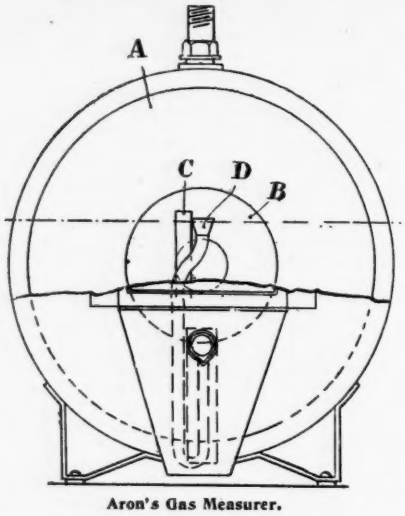
No. 15,949; July 8, 1912. Convention date, July 12, 1911.

This invention relates to gas measuring instruments in which the sealing medium employed is a non-volatile liquid—such as a mineral oil; and the object is to provide a meter "which shall be reliable in operation and maintain a constant degree of accuracy in measurement under all conditions."

In meters as usually constructed, the patentee remarks, even if the sealing liquid maintains its level substantially constant for a long time under ordinary conditions, it is necessary to refill the meter from time to time "since, owing to variations in pressure and temperature, &c., the

sealing liquid may overflow into the lower liquid chamber through the overflow passage provided for the purpose, so that if the meter is not subsequently refilled the sealing liquid will be too low, and thus permit the supply of a larger amount of gas than is registered by the meter and charged to the consumer." This defect can be obviated by raising the level of the overflow passage; but such a modification is found, he says, to give rise to other and more serious objections, particularly in the case of gas-meters utilizing non-volatile liquids as the sealing medium, since such liquids are liable to some variations in volume at the beginning of its use for a certain period of time. When a meter of this type is refilled with fresh mineral oil, it is observed that at first there is a rise in the level of the liquid, due to the fact that certain constituents of the gas passing through the meter dissolve in the fresh oil, and thus increase its volume until, when the oil reaches a condition of saturation, any further absorption of the constituents of the gas ceases, and the level of the liquid attains a maximum value, which is not, however, permanent—the level of the liquid subsequently decreasing to a small extent until, after a comparatively short period of time, the level attains a permanent constant value under normal external conditions. Under abnormal conditions, however, especially when the meter is installed in an unusually hot or cold place, further alterations occur in the level of the sealing liquid. Any increase in the level of the overflow passage, which as usually arranged also serves to conduct the gas to the interior of the meter, cannot eliminate the error in measurement due to the temporary rise of the level of the liquid; and, on the other hand, no compensation would be effected for a reduction in level. If, however, an overflow and gas conducting passage arranged in the usual manner is employed, the upper extremity of the passage being at the normal level of the sealing liquid, a rise in the level of the liquid is liable to cause, to a considerable extent, not only the lower liquid chamber to be filled, but also the overflow passage above the level of the inlet opening for the gas. Thus no gas can enter the meter, and it would accordingly cease to operate.

In order to obtain accurate measurement of the flow of gas without continual adjustment of the level of the sealing liquid, the meter, according to this invention, is provided with an overflow and gas conducting pipe or passage extending above the normal level of the sealing liquid to a considerable extent, as has previously been proposed; the



Aron's Gas Measurer.

meter being, however, provided with a drum of the usual double type, so that any error in measurement due to an alteration of the level of the sealing liquid is approximately compensated.

The invention thus consists in a combination of two well-known features to produce a new result.

In the diagram, the two drums A and B are arranged one inside the other in such a manner that the gas flows in one direction into the annular space between the larger and smaller drums, and thence passes in the opposite direction through the interior of the smaller drum. The volume of gas delivered at each revolution of the drums is thus equal to the difference between the volume of the space within the larger drum A above the level of the sealing liquid and the volume of the corresponding space within the smaller drum B. Any variation in the level of the liquid causes a smaller difference in the volume of the gas measured than if only one measuring drum were provided. The upper extremity of the overflow pipe C serving to conduct the gas to the measuring drums, is arranged considerably above the normal level of the sealing liquid. In order to initially adjust the level of the liquid at the proper position for accurate measurement, an upwardly projecting tube D constitutes a level-determining device; the tube being connected to a syphon at its lower extremity, so that when the meter is filled with sealing liquid a small quantity of it passes into the syphon and prevents any escape of gas from the interior of the meter. The tube is closed at its outer end after the adjustment is made; and then no further liquid can pass into it.

The combination of elevated overflow passage and compensating double measuring drum are said to enable the advantages already mentioned to be obtained.

Inverted Incandescent Gas Mantles.

PLAISSETTY, A. M., of Brussels.

No. 13,134; June 4, 1912.

This invention relates to a process for manufacturing mantles (especially mantles of artificial silk) for inverted burners, characterized by the fact that one end of the fabric tube, from which the mantle is made, is cut into a series of points or tongues which are connected to one another by stitching in a manner to form the bottom of the mantle. [An illustration of the arrangement proposed appeared in the "JOURNAL" for Nov. 26, p. 683.]

APPLICATIONS FOR LETTERS PATENT.

27,678.—CLAYTON, J., and TAYLOR, R., "Taps or valves." Dec. 2.
27,686.—KING, J., JUN., BURNETT, J. R., and the RICHMOND GAS STOVE AND METER COMPANY, LTD., "Gas-furnaces." Dec. 2.
27,706.—WOLTERECK, H. C., and MOELLER, J., "Production of light oils from crude, &c., oils." Dec. 2.
27,711.—SCHWABACHER, H., "Manufacture of air gas." Dec. 2.
27,715.—MORIN, A. A. E., "Cocks or valves." Dec. 2.
27,741.—JENKINS, F. A. E., and GABB, J. L., "Leak finder and localizer." Dec. 2.
27,779.—HILL, J. H., and BUCKLE, H., "Dynamic distance gas-lighter." Dec. 3.
27,814.—M'BRIDE, W. D., "Projecting light." Dec. 3.
27,824.—GRAHAM, J. & A., JUN., "Reducing valves." Dec. 3.
27,839.—M'DERMOTT, R. R. A., "Taps or cocks." Dec. 3.
27,913.—SUMMERS, H., and COLLETT, W. R., "Gas-heating stove." Dec. 4.
27,920.—SIMMANCE, J. F., and ABADY, J., "Calorimeters." Dec. 4.
27,924.—SIMON, L. J., "Heating liquids by electric resistances or gas." Dec. 4.
27,949.—STETTINER CHAMOTTE-FABRIK AKT.-GES. VORMALS DIDIER. "Discharging vertical coking chambers." Dec. 4.
27,967.—FINSTERBUSCH, F., and KANTOROWICZ, H., "Gas propelling plants." Dec. 4.
27,979.—COCARD, J., "Operating valves from a distance." Dec. 4.
27,996.—SHEPHERD, F. H. S., "Cleaning pipes." Dec. 4.
28,019.—DRUMMOND, J. & A. Y., "Gas-fires." Dec. 5.
28,072.—STILL, C., "Direct recovery of ammonia." Dec. 5.
28,080.—BARK, B., and the WELSBACH LIGHT COMPANY, LTD., "Mantle boxes." Dec. 5.
28,091.—LANGHANS, R., "Incandescent gas lighting." Dec. 5.
28,100.—CUTLER, S., JUN., "Trackway for electric telphers." Dec. 5.
28,104.—WEISS, E., "Pyrophorous lighting devices." Dec. 5.
28,115.—BENSON, R. S., and HEAD, WRIGHTSON, AND CO., LTD., "Screening or grading and conveying coal, coke, &c." Dec. 5.
28,161.—FLAVEL, P. W., "Gas-fires." Dec. 6.
28,186.—STOKES, F. W. S., "Compressing air or gas." Dec. 6.
28,193.—FORWOOD, G. F., and ROSTIN, H. P., "Bunsen burners." Dec. 6.
28,216.—OSTROROG, Count S. J., "Attachment for gas-cocks." Dec. 6.
28,244.—THORP, F. & H. T., "Enclosed gas-fire." Dec. 7.
28,282.—HILLS, M. H. & W. A., "Distillation processes." Dec. 7.
28,289.—CLOUD, J. W., "Pipe-joint." Dec. 7.
28,307.—SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., "High-pressure gas-lamps." Dec. 7.

Settlement of the Gas-Workers' Dispute at Macclesfield.

The settlement at Macclesfield followed upon an amended offer by the Corporation; and the notices to cease work have been withdrawn. The chief difficulty in the way of terms being arranged at the beginning of last week was the demand of the stokers for an increase of 4½d. per shift. Under the terms of settlement, this class of worker will receive 5s. 8d. per shift, compared with 5s. 9d. asked for. The lamplighters wanted an advance of 2s. weekly—making their pay 25s., and also wished to be supplied with coats and leggings. They are to receive an increase of 1s. a week. Coal wheelers and general labourers are to be paid 5d. per hour instead of a minimum wage of 25s. per week demanded. The request of all grades for a week's holiday with pay each year is not conceded. The increases take effect immediately.

Heavy Cost of a Corporation Bill.—In the House of Commons last Tuesday, Mr. Jowett asked the President of the Local Government Board if he would ascertain the total cost of the Swansea Corporation Bill of this session to each of the Local Authorities concerned, and state the result of his inquiry. In reply, Mr. Burns said he was informed by the Local Authorities that, so far as could be ascertained, the costs incurred by them in connection with the Bill in question were approximately as follows: Swansea Corporation, £8578; Oystermouth Urban District Council, £3840; Swansea Rural District Council, £1960; Glamorgan County Council, £1552—a total of £15,930.

Urban District Council's Trade in Gas-Fittings.—For some years the Gas Committee of the Croston Urban District Council have been in the habit of supplying gas-fittings to residents, and the practice is one that has at various times been the cause of considerable discussion, arising from protests made by local tradesmen. At the last meeting of the Council, Mr. Stazicker reintroduced the subject. He said that the Gas Committee had come to the conclusion that it was desirable, for the sake principally of those in the town who sold gas-fittings and who were large ratepayers, that they should have the privilege of supplying these goods without opposition from the Local Authority. He proposed, therefore, that, commencing on the 1st prox., the Council should discontinue the practice of supplying gas-fittings. In the discussion which ensued, Mr. Hale observed that it did not follow, if the Council discontinued the sale of these goods, that the trade would stop in the town; and Mr. Rigby declared that the Council had been making a nice profit from supplying fittings. Mr. H. Riding, the Surveyor, stated that they made a profit of 1s. on pendants, which cost the Council 3s. Sold at 4s., this gave them a profit of 25 per cent., which could not be called exorbitant. For all he knew, tradesmen might be making 100 per cent. profit. Finally the resolution was rejected; and the Council will continue to supply fittings as hitherto.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Residuals Inquiry—What is to be Done Next?

SIR,—Now that the battle has been fought and won, it is only natural to inquire why this should have been necessary. Why should gas undertakings have been put to the trouble and expense of combating unsuccessfully the imposition of a clause which within a few short months has been pronounced undesirable? Opposition to it in one case alone cost nearly £1000, much of which was incurred in collecting evidence practically identical with a good deal that was given, with effect, before the Joint Committee, but which a Lords Committee refused to hear. What is the remedy?

17, *Victoria Street, S.W., Dec.* 14, 1912. CHAS. HUNT.

The Old Pioneers and Standard Bearers.

SIR,—The passing year has witnessed the formal acknowledgment of the leaders in the engineering and manufacturing departments of the gas profession by the conferring of University Degrees upon three of the foremost men still in harness; and the shadow of the coming events of the ensuing year, which marks the Centenary of the employment of coal gas as a public servant, denotes further honours in this direction.

Important as the engineering and manufacturing departments are, they would, in themselves, fall short in their utility were it not for the developments of the pioneers and their successors in the distributing and lighting departments. To these, we are indebted for those applications which have rendered the manufacturer's commodity so eminently useful and, by virtue thereof, so commercially successful. Looking back over forty years' association with gas affairs, two names stand out prominently in this respect—of men who, in their day and generation, did so much for the enhancement of the success of gas lighting, before the days of the incandescent mantle. And while the men themselves have passed "to the bourne from whence no traveller returns," their names are still as "household words:" and "William Sugg" and "George Bray" have no compeers in this department. To these, we may appropriately add another name, from a different department, almost, if not quite, as useful—"Thomas Fletcher," whose early experiments and application of gas to heating apparatus has probably no equal.

Christmas time is not necessarily a gas engineer's and manager's holiday season; but there may be moments in connection therewith when the common pervading spirit of "goodwill," and the peaceful quietude associated therewith may provide an opportunity for vision or revision of old friends, as well as new. It may, therefore, be an opportune time to consider, as the forward look into the New Year, and its Centenary celebrations occupy the mind, whether something could not be done to recognize in some fitting way the old pioneers and standard bearers in these departments as well as in others.

The form of recognition is matter for consideration and suggestion according to means; but a "William Sugg Scholarship" or a "George Bray Bursary" (and, indeed, why not also some leader in Technical Journalism, to whom we are so much indebted for the dissemination of information?) might be a fitting monument to the memory of such faithful and ardent servants of the profession, in honouring whom it would enhance its own honour.

East Grinstead, Dec. 12, 1912. D. THOS. LIVESEY.

Coal Stacking and Coal Firing.

SIR,—I was very interested in Mr. Kendrick's paper regarding fires in coal-stores, and can endorse his contention that small and powdered coal is usually the cause of such heating. When I was in Bombay, it was quite usual for us to have a number of heaps alight during the year. These fires took place in the coal-sheds, in which the coal was never stacked more than from 12 to 15 feet high. Fires in stacks outdoors were comparatively rare; and the places where such fires took place were always where the coal had been reduced to powder by the continuous trampling of the bare feet of the men and women who carried the coal in small baskets on their heads up the sides of the heaps. In coal which has been brought over seas and unloaded in the simple methods adopted in the East, there is always considerable small coal and dust, and the coal is more easily crushed when stacking. We always found water useless to stop such fires. The only satisfactory method we could find was to engage a gang of coolies to dig and rake out the hot coal, and use it at once for the retorts.

Edinburgh, Dec. 9, 1912. HENRY O'CONNOR.

Outside Lighting of Shop Windows.

SIR,—I have read with much interest the leaderette in the last number of the "JOURNAL" entitled "New Lights for Old in the Outer Suburbs," and particularly note the statement that "most of the shopkeepers find it totally unnecessary with the new lamps to have lights among the goods in the window; and this is both an advantage and an economy, as now the lights do not interfere with the window dressing." I have always been of opinion that shop windows should be lighted so that the goods in the window can be easily seen, but not the lights themselves; and I drew attention to this point in my Presidential Address to the Manchester District Gas Institution in 1904.

In looking at articles in shop windows, I have often been baffled to decide as to the quality, or even the colour, of the goods, owing to the glare of the lights in the window. This is particularly the case where metallic filament electric lamps are used. This drawback can, as you say, be completely overcome by lighting the windows by means of outside lamps. It is also very much safer. Some terrible fires have occurred in recent years through placing electric lights among the goods in shop windows.

While high-pressure gas-lamps are, no doubt, admirably adapted for the outside lighting of shop windows, this can also be effected in a much cheaper and more simple manner. In common with other engineers, I am much enamoured of high-pressure gas lighting, and last spring prepared a scheme for this city. Before, however, carrying it out, I endeavoured to ascertain what measure of support we should be likely to receive from shopkeepers and others. We soon found that while the cost of high-pressure gas-lamps might be no drawback in shopping centres like London, it was prohibitive in Wakefield; so we decided to see what could be done with low-pressure lamps. We are now doing a very large business with these on simple hire at much less than the usual charge for high-pressure lamps. Our show-room is lighted by a generous provision of the most up-to-date high-pressure lamps, but shops lighted by the latest low-pressure lamps, in close proximity, hold their own very well in comparison; and several of the leading shopkeepers in the city whose shops are lighted in this manner have removed their electric lamps from the windows, as they find they are adequately lighted without them, and they can dress the windows better when these lights are out of the way. There is also no glaring light to catch the eye and take the attention of customers from the goods in the window.

There is another important aspect of this matter. The great bugbear of shopkeepers is steamed windows, which both obscure the view and spoil the goods. At this time of the year, it is necessary, for the comfort of customers and assistants alike, for shops to be artificially heated. The warmer the air becomes, the more moisture it contains in suspension. The cold air outside cools the glass of the window, and this then condenses the warm air in contact with it inside the shop, and deposits the moisture upon it, which thus becomes a nuisance to the shopkeeper. Outside shop lamps, by warming the glass on the outside, help to cure this trouble; and if the shop window is ventilated, as it should be, all its length, both top and bottom, causing a current of cool air to be in actual contact with the glass inside the window, moisture cannot be condensed, and a complete cure is effected, while fresh air is admitted and foul air expelled from the shop. Dust can be excluded by means of suitable screens in connection with these ventilators. If the air outside the shop is much warmer than that inside, moisture may then be deposited on the outside of the window. This is, of course, easily remedied by warming the air in the shop to the same temperature as that outside. It is strange that the great shopkeeping community should continue to suffer from steamed windows when they can be so easily prevented.

Wakefield, Dec. 13, 1912. H. TOWNSEND.

Carbonization in Vertical Retorts.

SIR,—I think it is wholly accepted that no part of a professional journal calls more for that exactness of truth than the "Correspondence" column, and especially so when comparisons are being discussed and criticized.

Mr. Toogood, in your last issue, contributes another letter, wherein he might claim, in his own words, "apparent inconsistencies." In no part of my letter published in the "JOURNAL" for Nov. 19 can any such references be found as "free spaces," "less dense coke," or "exit of the evolved gases," as imagined by Mr. Toogood to suit his own reading.

There is no hope of satisfying Mr. Toogood on any points emanating from the Birmingham discussion, if he so wilfully insists upon making himself "impermeable" to facts, and inconsistent throughout.

Dec. 13, 1912. CONSISTENCY.

[Our correspondent says this discussion must now terminate, so far as he is concerned.—ED. "J.G.L."]

Mr. Herbert Buckley, the Engineer to the Windsor Royal Gaslight Company, writes to point out a slip which occurred in the report of his evidence before the Residual Products Joint Committee (p. 843). The sulphate of ammonia plant installed at his works is capable of making 20 to 25 cwt. of sulphate per day—not "per annum," as was inadvertently stated in the report.

Coal Resources and Municipal Gas Supply.

Lecturing on "Coal and Coal-Bearing Rocks," at the Bradford Mechanics' Institute, Professor P. F. Kendal, of the Leeds University, referring to the question of the duration of the British coal supply, said it had been estimated that there were at present 100,000 million tons of coal available in seams down to 1 foot in thickness, and within a depth of 4000 feet; and that this supply would last something like 400 years if coal continued to be used at the present rate. But this rate was an accelerating rate. Was there, however, any hope that while the efficiency of the coal supplies was maintained the increase in consumption might slacken? He was inclined to think there was a possibility in this direction; and in that connection he looked to the use of gas as the great ameliorator both of the waste of fuel and of sunshine. He emphasized, however, the need for a revision of the present-day municipal gas policy. Leeds, he observed, last year made a profit of £50,000 on its gas undertaking, which it handed over to the relief of the rates. It took it out of one pocket, and put it in another. This £50,000 would represent something like 4d. per 1000 cubic feet on the price of gas; so that Leeds was paying 4d. too much for its gas. This was, he declared, a most foolish, wasteful, and ruinous policy; and he did not think it was a policy in strict accord with municipal integrity.

Londonderry Water Supply.—In the "JOURNAL" last week, it was reported that the Londonderry Town Council had defeated, by a majority of two, a motion to rescind a resolution for the completion of the Burngibbah auxiliary water supply scheme. At a subsequent special meeting, however, Mr. M'Gahey, who was unsuccessful on the previous occasion, again submitted his motion, and it was carried by 18 votes to 13. The scheme will not, therefore, be proceeded with.

MISCELLANEOUS NEWS.

SALFORD GAS-WORKS EXTENSION SCHEME.

The principal business dealt with at the adjourned meeting of the Salford Town Council on Wednesday last was that relating to the acquirement of land in Liverpool Street for gas-works purposes, at a cost of £53,000. As stated in last week's issue (p. 847), this is part of a scheme of extensions which, it is estimated, will ultimately involve an expenditure of £275,000 in connection with the gas undertaking of the Corporation. The proposal to purchase this particular site, containing 38,790 square yards, dates back to 1908, when a resolution in favour of its acquirement from the Earl of Ellesmere was actually passed by the Town Council. Of course, many things have happened since then; and the policy of the Gas Committee in the matter of the development of the undertaking has been hindered by opposition from the out-districts within the Corporation's area of supply. It is, however, all too recent history to need recapitulation.

At last Wednesday's Council meeting, the discussion brought out no new points on the subject, but it was early evident that the opposition to the purchase, shown so strongly at the November meeting of the Council, had considerably weakened—probably because of the publication of the reports of the experts called in to advise the Corporation—namely, Mr. Corbet Woodall and Mr. E. H. Stevenson. Alderman F. S. Phillips (the Chairman of the Gas Committee), when moving the resolution authorizing the purchase of the land, and instructing the Finance Committee to make application to the Local Government Board for sanction to borrow the £53,000 under the provisions of the Salford Order, 1912, said the question of an extension at the gas-works was one of vital importance to the borough. They were greatly handicapped, he added, owing to the fact that they could only make sufficient gas to keep the undertaking going day by day; and in the case of continued fog the position would be a serious one. Mr. W. P. Burnley, seconding the resolution, told the Council that increased storage capacity was absolutely necessary. It should not be forgotten that they had to supply, not only the borough, but a number of large out-districts, under severe penalties.

Opposition to the proposed purchase was led by Mr. A. Williamson, who entered upon a strong criticism of the policy of the Gas Committee in the past in not carrying out what he called necessary improvements at the gas-works. Instead of doing this, the Committee had been giving on the average some £26,000 in relief of rates. Another opponent of the scheme was Mr. J. Bratherton. Salford, he submitted, got the worst of the bargain in connection with the recent Provisional Order; and this scheme was brought forward to absorb the profits beyond the £10,000 which the Gas Department were to be confined to as a grant-in-aid of rates. Mr. Bratherton also held that the Corporation were being called upon to pay twice as much for this particular land as that obtainable in the same neighbourhood from other owners. Mr. M'Dougall, who supported the Gas Committee, expressed the opinion that if the scheme was now adopted, the ratepayers would get cheaper gas, and that very soon.

In his reply on the discussion, Alderman Phillips said the Gas Committee were fully alive to the requirements and possibilities of the department. To say they had no forward policy was entirely wrong. What had happened was that for years they had been handicapped by being forced to hand over more money for the relief of rates than they could afford, in addition to which they had been faced with a good deal of opposition from the outside authorities supplied with gas from Salford. Evidence given before Parliament and the Local Government Board inquiry regarding the Provisional Order, 1912, showed conclusively that the Salford gas undertaking could, and did, make substantial profits. But more storage capacity was an immediate necessity; and if the Gas Committee were given a free hand, the ratepayers could hope for a substantial reduction in the price of gas—and that before the present financial year was out.

On the matter being put, Alderman Phillips's resolution was carried by 26 votes to 17.

ADVANTAGES OF GAS FOR COOKING AND HEATING.

Lecture by Mr. Alex. Wilson.

Under the auspices of the Smoke Abatement League of Great Britain, Mr. Alex. Wilson, M.Inst.C.E., the Engineer and General Manager of the Glasgow Corporation Gas Department, delivered an interesting lecture on the above-named subject in Glasgow last Thursday. At the outset, Mr. Wilson dealt with the pollution of the atmosphere by domestic and factory chimneys. He said that in the industrial world it was being recognized that smoke sent out from chimney-tops meant waste; and many progressive manufacturers were taking steps to carry on their heating with more economy and less danger and discomfort to the surrounding inhabitants. He gave some interesting figures showing the price paid by the community as the result of the smoke evil, which indicated that in the summer months the death-rate per 1000 of the population was low, as compared with the winter season, when there were the fogs to contend with. In the summer of 1909, the death-rate was about 11 per 1000; but during the same year, in the month of November, it reached in one week, when there was a very heavy fog, the appalling figure of 32 per 1000. Manufacturers were now beginning to realize that gas-heated furnaces for melting metals and for hardening tools, &c., could give more satisfactory results than the other methods in vogue, as a larger amount of work could be dealt with and a greater saving effected in crucibles, furnaces, &c.

Cooking-stoves were separately illustrated, and the saving of labour and worry and the economy secured by using them were fully demonstrated. The lecturer spoke at length of the benefits to be derived by the use of gas-fires and other heating appliances for domestic purposes, and instanced the difficulties and drawbacks to satisfactory heating by the coal-fire. He pointed out, also, that no gas-fire ought to give the slightest odour in a room. In cases where complaints were made about fires giving off bad smells, it was usually found that the fault lay with the owner, who might use a fire for years, and never think of having it overhauled. Hot-water circulators were beginning to secure a footing in Glasgow; and people who were using these handy appliances realized the great advantages of this system of getting a supply of hot water at all times.

Referring to the business that had been done in the Gas Department since the inauguration of the systems of lending cooking appliances and hiring gas-fires to consumers, Mr. Wilson stated that upwards of 54,000 of the former had been put in since the 1st of March last, and about 7000 gas-fires had been fixed since the 1st of June; and there were a few thousand orders for these appliances waiting to be executed.

During the evening, two lady assistants carried out a cookery demonstration on the platform; and at the close of the lecture much interest was taken in the various dishes prepared by them.

BURTON GAS COMMITTEE AND STOVE AND LAMP HIRE.

Agreement with Traders.

At a meeting held on the 25th ult., the Gas and Electricity Committee of the Burton-upon-Trent Corporation had again under consideration the question of the hire of gas-fires and the use of lamps for shop lighting, to which reference has already been made in the "Journal." In order to carry out the understanding arrived at between the Committee and a deputation from the Burton and District Ironmongers' Association, allied with the gas-fitters and plumbers, the Committee decided: (1) To purchase from the Richmond Gas Stove and Meter Company, Limited, and Messrs John Wright and Co., for the present season, and let out on hire for periods of not less than twelve months, high-grade gas-fires at the following annual rentals, which include fixing free of charge, provided that not more than 50 feet of piping are required: Gas-fires 10 inches wide across the fuel, 4s.; the same with side boiling burners attached, 6s.; gas-fires 13 and 14 inches wide across the fuel, 8s.; the same with duplex burners and dual tap, allowing half the fire to be turned out, 10s. (2) That the work of fixing all gas-fires supplied on hire, and the necessary piping and fittings, be carried out by the local gas-fitters, ironmongers, and plumbers in accordance with the regulations and schedule of prices attached thereto; the agreement to be terminated by either party giving six months' notice. (3) That gas-fires similar to those to be let on hire should be lent to local gas-fitters and ironmongers for them to exhibit. (4) That in cases where the letting of gas-fires on hire is shown to be hindering a local gas-fitter, ironmonger, or plumber from selling the gas-fires which he had in stock when the Committee's recommendations on the matter were made public, they will arrange to buy the fires from him at a valuation, provided that application for this to be done is made in writing by the tradesman affected not later than Dec. 31, 1912. The Committee further resolved that inverted three-burner incandescent gas-lamps be let out on simple hire for outside shop lighting, at a rental of 17s. per annum, including fixing, *plus* an additional 7s. per annum if free maintenance, including the supply of mantles, is carried out by the Committee, on condition in both cases that the consumer undertakes to hire the lamp for not less than three years. The cost of the supply-pipe and the man's time in fixing outside shop lamps, whether they are supplied on hire or purchased outright, should be defrayed by the Committee on conditions specified. The work of fixing the supply-pipes and lamps is to be carried out by the local gas-fitters, ironmongers, and plumbers in accordance with regulations and a schedule of prices to be prepared, the settling of which, and all questions in connection therewith, were left to the Chairman of the Committee and the Assistant-Manager (Mr. R. S. Ramsden).

The matter came before the Council at their monthly meeting last week, when Mr. Wardle, the Vice-Chairman of the Committee, in moving, in the absence of the Chairman, the adoption of their report, stated that a complete schedule of prices and all necessary agreements had been drawn up and approved between the Corporation, represented by himself, Mr. J. Ferguson Bell (the Consulting Engineer), and Mr. Ramsden, and four delegates appointed by the three classes of tradesmen involved. After a long and careful discussion, a fair and equitable agreement had been arrived at, which they believed would be advantageous to all parties. The report was adopted.

CO-PARTNERSHIP AND AN EIGHT-HOUR DAY.

West Greenwich Gas-Works Institute.

A thoroughly enjoyable evening was spent last Saturday on the occasion of the annual dinner at the West Greenwich Gas-Works Institute, which had been gaily decorated for the occasion; and those responsible for the arrangements are to be heartily congratulated upon the success which attended their efforts. A good programme—including songs, recitations, and conjuring—had been prepared; and an important item in the proceedings was the presentation of prizes in connection with the Cricket Club. Mr. J. F. Braidwood, the Engineer of the West Greenwich Station of the South Metropolitan Gas Company, presided; and he was supported by Mr. F. M'Leod (the Secretary), and Messrs. J. A. Waterer and J. Newbold (Employee Directors), P. Richbell (Chief Cashier), N. S. Braidwood, C. T. Drumgold (Chief Storekeeeper), J. D. C. Hunter, J. White, H. Day, H. Colebrook, H. W. James, A. Showell, B. A. Braidwood, W. King, H. Austin, J. Wakeford, G. Jones, C. E. Crabbe, and others.

As is usual on these occasions, the speeches were few, but, as is also usual, they were much to the point. The Loyal Toast having been duly honoured, the Chairman proposed "Success to the South Metropolitan Gas Company," coupling with it the names of the Chairman,

Directors, and Chief Officers. He remarked that the Chief Engineer (Mr. W. Doig Gibb) was unavoidably absent, owing to a bereavement, and went on to emphasize the fact that their Company was the best concern that any employee could work for. This sentiment met with the hearty approval of the large gathering. Even the recreation of the men, he went on, was studied in every possible way—as witness the Institute, which was given to them so that they might enjoy healthful amusement. There were also fields for games. The toast was responded to by Mr. M'Leod, who endorsed what had been said as to their Company being the best that anyone could work for. The great advantage of working for a concern where the treatment was such as they enjoyed was, he feared, frequently not fully realized—especially by those who had not had experience elsewhere. Men who had been buffeted about, thought when they got a job in London that they were in heaven; and when this job happened to be with the South Metropolitan Company, it was the seventh heaven. The facilities offered by the Company for every kind of rational recreation were only too uncommon; and it was the touch of humanity and comradeship which existed between the Directors and management and everyone employed, that augured so well for the future of the undertaking. Undoubtedly, the outstanding feature of service with the Company was the co-partnership scheme ["Hear, hear"], the effects of which had not yet been fully gauged. The employees, shareholders, and consumers were joined together in partnership. But the benefits and privileges extended to the men by the system brought with them, of course, corresponding obligations—a fact which must always be borne in mind. Trifling matters frequently had very great results; and if there were some 6000 employees all bound together by a common desire to do the best they could for the undertaking, it seemed to him that nothing could prevent the continuance of the success which had for so many years attended their Company. Since the inauguration of the co-partnership system, considerably more than half-a-million of money had been distributed in bonuses—no portion of which money would, under other conditions, have found its way into the pockets of the employees. Turning to a portrait in oils of the late Sir George Livesey, which appropriately hangs in the Institute, Mr. M'Leod added: "You cannot do better than look at that picture every time you come into the room, and realize that the late Sir George Livesey is the man who conceived the idea. He had a passion for justice and fair-dealing. I believe that was the mainspring of his action in formulating this splendid system. I hope his memory—as I feel sure will be the case—will always be kept green in our hearts."

In proposing the health of the Chairman, Mr. Richbell spoke highly of Mr. Braidwood's attitude towards those who work under him. There was, he said, no better Engineer to work under than Mr. Braidwood. As showing the consideration exhibited by the Chairman (Mr. Charles Carpenter) and the Directors for the employees, he referred to the boon which had recently been granted them all in the shape of an eight-hour day. He could speak with some feeling on this particular matter, because many years ago, when he first joined the Company, he believed the hours of work were from 6 o'clock in the morning until 5.30, and 4 o'clock on Saturday. The time then became 2 o'clock on Saturday, and after that 1 o'clock. Now the Chairman of the Company had come forward—and he thought he was right in saying without pressure from the employees ["Hear, hear]"—and made this offer to the workmen, which they had gratefully accepted. In acknowledgment, Mr. Braidwood said he was always pleased to do anything he could for the men at the station. These annual gatherings were very pleasant, and their thanks were due to those responsible for the arrangements. Among others he referred to in this connection were the Committee of the Institute and the Hon. Secretary (Mr. H. P. Hollis).

SCOTTISH JUNIOR GAS ASSOCIATION—WESTERN DISTRICT.

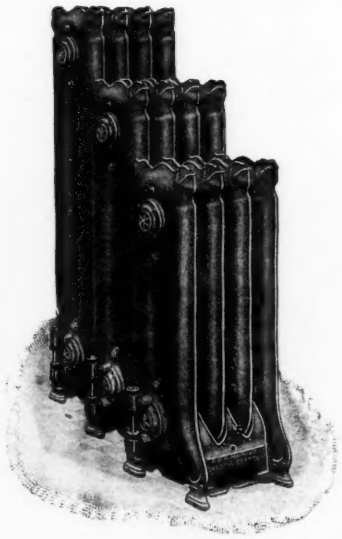
Annual Dinner.

The Annual Dinner of the Scottish Junior Gas Association (Western District), held in Sloans' Restaurant, Glasgow, on Saturday, was a most successful function, comprising a large number of the members, their friends, city councillors, and members of kindred associations. Mr. F. L. M'Laren, of Dumbarton, presided.

Bailie Paxton, the Convener of the Glasgow Corporation Gas Committee, in proposing the toast of the "Scottish Junior Gas Association," referred with pleasure to the fact that the young men of the Association were paying particular attention to the methods of gas sales. It was gratifying to learn in the gas journals of the visits paid to various places in the search for information. This was a great privilege the young men were now receiving, as compared with the older men in the gas industry. In the past, they had not the same facilities as now for educating themselves. He expressed the pleasure he had felt in attending the meetings of Gas Associations year by year. No doubt the young men were looking upon the commercial side of the industry. They were realizing more and more each year that it was one of the most important parts of the profession. They had selected Mr. Halkett for the position of Commercial Manager in Glasgow. He had now been working for some time; and he believed he would make a splendid neighbour. He asked the members to give him the right hand of fellowship. There had been many complaints about Glasgow gas; but from inquiries he had made, most of the complaints were really groundless. In this connection he told an amusing story. That afternoon he had visited, along with a number of the city magistrates, a certain institute some distance outside Glasgow. The light in the hall was very poor, and he, being Convener of the Gas Committee, came in for some hearty criticism. Just when the chaff was at its height, the manager of the institution appeared and turned the master tap (which was only partially open) on full.

The Chairman, in reply, said it was pleasing to find the Glasgow

By Test the Best.



THE "Main" Gas-heated Steam Radiators give the best heating results.

They are made on the soundest mechanical lines with metal to metal joints (no rubber or red lead used).

They are absolutely safe. Each Radiator is capable of standing a pressure of six times the maximum that can be obtained in actual use.

And last, but not least, they are fitted with our patent, automatic regulating valve—the most efficient and positive device of its kind. It reduces the gas consumption immediately the temperature rises. Ensures economy and prevents the waste of gas, which is inevitable with a valveless radiator.

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WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

Corporation Gas Committee taking such an interest in the affairs of the Association. This was an age of bustle and hustle and continual change. There were those among their members who were inclined to wonder when their time was coming. They should be a little patient, and keep up their studies and remember that the great thing was to be ready when the opportunity came.

Mr. JAMES M'GHEE, proposing the toast of "Kindred Associations," said that the relation between the various bodies was one of real kinship. The Associations throughout the country, by the aid they offered, were undoubtedly training up their successors to avoid the many mistakes which had been made in the early days by themselves. He expatiated on the help Mr. Wilson had been to the Association.

Mr. ALEX. WILSON, the General Manager of the Glasgow Corporation Gas Department, in replying, said that in former days the older Associations thought they really occupied the whole field, but had now come to look upon things with a very different eye. They saw they could not occupy the whole field. They could get a great deal of assistance from the younger Associations such as their own. The papers read before the Junior Associations put new ideas into the older heads; and they, as young fellows, looked at things from a different point of view. Co-operation was the order of the day all round. It was so in the gas industry at the present time. All the Associations were working together. Gas engineers had done an immense amount of work. Recently they had been defending the industry from an attack started by an outside body—the Alkali Manufacturers' Association, a very strong body of traders who were trying to prevent the gas industry doing the best for themselves and for their consumers. He was very glad to know that the Joint Committee of the House of Commons and the House of Lords had been able to put a brake upon their aspirations in the meantime. The decision they had given would keep them right for a long time to come. Another scheme of co-operation had been the formation of the British Commercial Gas Association. They had all felt that something was needed in the way of putting on a better footing the selling business of the gas undertakings; and the result was that an Association had been formed composed of gas engineers and managers and manufacturers of appliances. They were just at the beginning of great advances in the gas industry. Some used to think they were going to get snuffed out. He thought the second century of gas lighting was going to be more wonderful than the first. In Glasgow, he did not think they had ever such a time as the present. They were over-run with work in all directions. The selling department was going to benefit every department. They must go on extending their works very soon, because they had got nearly to the limit of their resources. This was going to help old and young members. More work meant more positions to fill.

The CHAIRMAN then presented Mr. Leckie, of Holytown, with the gold medal for the best paper read during the session of 1911-12, on "Experiences of a Manager in a Small Gas-Works." The second prize went to Mr. Grant, of Wall Street.

Mr. S. B. LANGLANDS, in toasting "The Visitors," gave neat little character studies of each; and Councillor IRWIN, the Sub-Convener of the Gas Committee, in replying, said he had one cherished conviction with regard to gas and gas lighting, and that was that, as the darkness of the night was dispelled where people crowded together, so were reduced the risks of wrong thinking and wrong living.

Mr. J. MACLEOD paid a tribute to Mr. M'Laren in the toast of "The Chairman." Mr. M'Laren, he said, though not directly connected with the gas industry, was intensely interested in it. His interest had developed from his connection with internal combustion work.

Mr. M'LAREN returned thanks, referring to the valuable work rendered by Mr. Fulton, the Secretary.

An enjoyable musical programme was given during the evening.

EAST SURREY WATER ORDER.

More Unsuccessful Opposition.

The Water Orders Confirmation Bill [Lords], containing the above-named Order, which had been reported by a Select Committee of the House of Commons and subsequently considered by the House, came up for third reading last Tuesday by order, after several adjournments owing to notices to move the recommittal of the Bill, with an instruction to delete the Order, having been placed upon the paper. Mr. A. C. Morton, in whose name one of the notices stood, to the above effect, said the East Surrey Water Company proposed to do something which would be injurious to the water supply of the inhabitants of Croydon or of people on the River Wandle; and he asked the House to insist upon the Company coming in another session with a Bill in the ordinary way, so that everybody's interest might be properly considered. Mr. Doris seconded the motion. He said, as a member of the Committee who had considered the Bill, he voted against the confirmation of the Order because he thought the powers sought by the Company were unfair to the millowners and others interested in the Wandle. Sir Edwin Cornwall submitted that the House should not, at the end of the session, interfere with the progress of an Order like the one before them. He said no one had anything but praise for the manner in which the Company had done their work; and he trusted the machinery of Parliament would not be used to destroy the Order, and deprive the rural population of Surrey of the opportunity of securing the water flowing through their district. The Deputy-Chairman of Ways and Means (Mr. Maclean) pointed out that the matter had been before the House on several occasions, and much time given to it. He suggested that the decision of the Select Committee should be supported, even though it was arrived at by the casting vote of the Chairman. Mr. Rawlinson also thought the House should trust their Committees, and not reopen questions which had been decided by them. After some further discussion, the motion was rejected by 169 votes to 70; and the Bill was read the third time and passed.

GAS BOILERS FOR HOT WATER PIPES OR RADIATORS.

SMALL INSTALLATIONS.

For heating up to 49 sq. ft. of heating surface the "GARAJO" is pre-eminent in economy and efficiency. It is cheap to instal and requires no attention.

LARGER INSTALLATIONS.

For larger installations, up to 200 sq. ft. of heating surface, the CALEFACTOR, with Bunsen Burner, is equally supreme. The Burner consists of three separate burners controlled by one tap; all three burners can be used to heat up the water quickly, then, once this is done, one of the burners can be turned out by turning the tap to "half-on" position.

LARGEST INSTALLATIONS.

Provision is made for assembling CALEFACTORS in batteries by placing them upon or alongside each other; there is practically no limit to the number that may be connected together.

The "Garajo."

For full particulars of these Boilers, see Booklet:—
"GAS HEATING FOR GARAGE OR GREENHOUSE."

JOHN WRIGHT & CO., Essex Works, BIRMINGHAM.

60

EDMUND EATON'S EFFRONTERY.

From "Truth."

The following remarks are reproduced from the City Columns of our contemporary "Truth," as they deal with a matter which has from time to time been the subject of strong criticism in the pages of the "JOURNAL." The writer says:

Mr. Edmund Eaton is growing more recklessly audacious in his raids upon the pockets of ignorant investors. His latest effort has been commended to my notice by an Irish Solicitor who was consulted about it. From the usual address, No. 6, Abchurch Yard, E.C., but under the new name of the Anglo-Russian Liquid Fuel Syndicate, Eaton is sending out a circular recommending a purchase of £1 shares in the South of England Natural Gas and Petroleum Company, Limited, which shares "we will not be surprised to find standing at a £4 premium." That is, of course, a perfectly veracious statement, if you read it aright. The Syndicate will not be surprised, because the shares will not attain a £4 or any other premium. The circular states that the Syndicate are "authorized by Colonel the Hon. Hubert V. Duncombe, D.S.O.," to enclose particulars of the Company; and these particulars include highly optimistic speeches purporting to have been made by the Colonel as Chairman and Mr. D. Wallace Heims as "Engineer-Managing-Director" at some meeting, the date of which is not mentioned. It would be particularly interesting to learn the date, because so recently as March last this Mr. Heims and another Director, Captain Fred. Jenkins, were prosecuted by the Board of Trade at Hailsham Petty Sessions for failing to make various statutory returns in reference to this Natural Gas and Petroleum Company. Their defence was that all the money obtained from the public—about £4300—by the issue of prospectus after prospectus had been swallowed up by the promoter (Eaton); so that not a penny was left to carry on the undertaking, or even apparently to pay for the preparation and posting of returns to Somerset House. This excuse did not, however, save Heims and Jenkins from penalties to the amount of £64.

It is quite in accordance with the Eatonesque methods that the shares in this moribund Company should still be palmed off on innocents, even after the police court exposure. But surely even the limit of the trickery permitted by the law is passed in the present case. The first page of the printed pamphlet of particulars is headed with the title of the Company and the amount of the share capital, followed by a list of names, from which I take the first three:

CHAIRMAN:

Admiral Lord Fisher, G.C.B., O.M., G.C.V.O.
The Right Hon. George Lambert, M.P.
Sir Boverton Redwood, Bart.

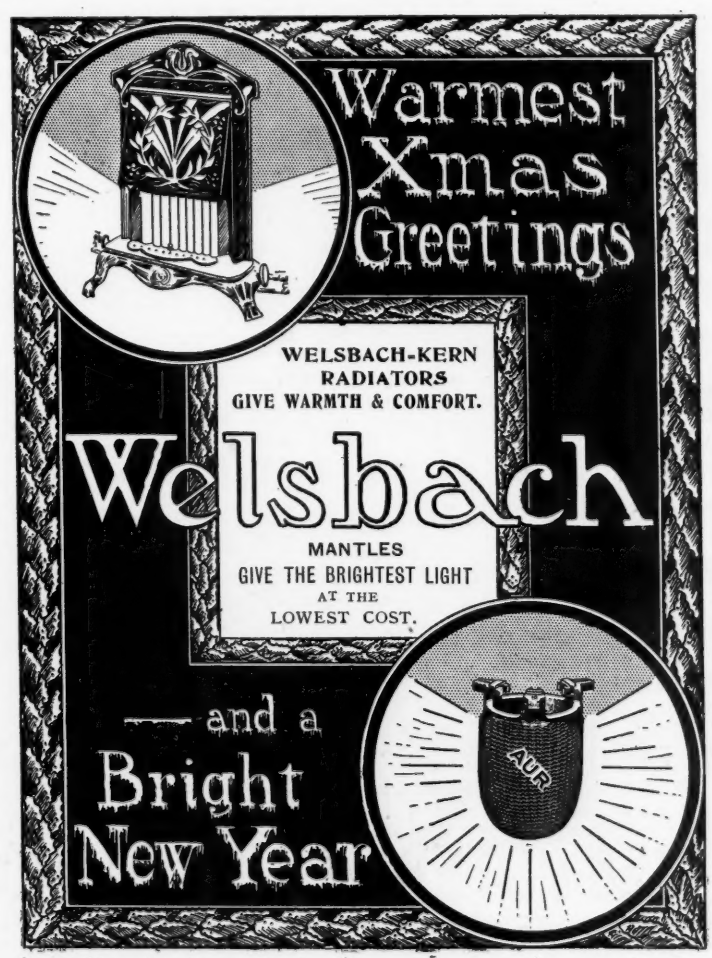
There are nine other eminent names; and at the foot of the list is the statement in small type: "The above gentlemen represent the Royal Commission appointed to inquire into the fuel supply of the British Navy." But in spite of this cunningly-worded saving clause, it is absolutely clear that the names are printed with the sole object of causing credulous people to suppose that Lord Fisher and the rest are Directors of this wretched Company. I venture to suggest that the members of the Royal Commission should communicate with the Public Prosecutor. The impudent and unprincipled misuse that has been made of their names ought to be dealt with in a criminal court.

NEWRY WATER SUPPLY.

A Polluted Source.

Important questions have arisen as to the water supply of Newry (Co. Down), which is derived from Camlough Lough, in Co. Armagh, about three miles from the town. At a recent meeting of the Urban District Council, the Town Clerk (Mr. W. M. Cronin) stated that reports from gentlemen who had made a bacteriological examination showed that the water was not sufficiently good for human use, and that considerable risk was incurred by drinking it unboiled. The Camlough Lough Trustees intimated through Mr. J. J. H. Swiney, a water engineer, of Belfast, that they were precluded from adopting certain proposals of the Council as to diversion of streams running into the lough, as, if they consented, they would not be able to keep up the statutory supply—625,000 gallons daily for the town, and 3,500,000 gallons for six days per week for mills and the local canal. The bacteriologists recommended that, in addition to filter-beds, there should also be a storage reservoir. The lough itself might serve the purpose, for it was found that, while the streams were highly polluted, the water leaving the lake for Newry was considerably improved by reason of its storage there.

The question then arose whether filtration alone would suffice to give a good and pure water supply. Professor M'Weeney, of Dublin, and Professor Wilson, of Belfast, were of opinion that it would; but some of the local medical men thought it would be of little service unless the polluted streams were cut off. The Borough Surveyor (Mr. Blaney) has received some papers from Dr. Houston, the Director of Chemical Examination of the Metropolitan Water Board, and, so far as they could see, he would not say that filtration would give a supply that could be relied upon without storage. This would be costly, for it would require about five acres of land. The alternative was, as Mr. Ruddy, a member of the Council, suggested, to get a new source of supply. The existing arrangement was that they had paid the Camlough Trustees £12,000, the original scheme having cost £28,000. There was no further liability, and the supply had been given for forty years. Eventually it was decided to leave the matter in the hands of the Clerk, on the understanding that he would call a special meeting to deal with it.



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WELSBACH
UPRIGHT MANTLES
ARE
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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.—A proposal is under the consideration of the Cleaning and Lighting Committee of the Edinburgh Town Council to inaugurate a system of high-pressure lighting for the Calton Hill and its approaches. The lamplighters of the city have presented a petition to the Town Council asking for an increase in wages. In Edinburgh, the wage paid is from 23s. to 25s. per week, with 102 lamps per man to look after, and about one-half of the lamps have to be extinguished at midnight. It is pointed out that the Edinburgh scale of wages is lower than that in several districts, which are specified, and the hope is expressed that, if only by reason of the increased cost of living, the decision of the Town Council of last year, when a similar request was defeated by a casting vote, will be reversed.

Aberdeen.—The Gas Committee of the Town Council have had under consideration a memorandum prepared by the Gas Treasurer on the subject of discount to gas consumers. From the memorandum it appeared that since 1898 the practice has been to treat the consumption in business premises and private residences as separate accounts, both as regards individuals and firms, and not to combine the consumption in both for the purpose of computing the discount. The Committee resolved that the present practice should be adhered to.

Bridge of Allan.—At the monthly meeting of the Town Council, a motion made by Councillor Innes, the Convener of the Lighting Committee, that the Council consider the advisability of acquiring control of the local gas supply, was considered. The motion was seconded by Bailie Brown, and was remitted to the Council in committee.

Cowdenbeath.—The Cowdenbeath Town Council have purchased the water-works of Loch Glow from the Dunfermline District Committee, at a cost of £10,500.

Dunfermline.—In connection with the laying of the gas-main to Culross, the work is now half-a-mile short of the estimated distance, and has been carried out for £600 less than the cost which was given to the Council when the scheme was adopted.

Falkirk.—An explosion occurred on Sunday at the Falkirk Corporation Gas-Works, as a result of which considerable damage was caused to part of the gas-works plant. The gas in the condensers suddenly exploded, with the result that the plates and portions of the pipes in the interior were blown a considerable distance away. The condensers were both completely wrecked, and will require to be entirely rebuilt. The amount of the damage is estimated at about £700, and is covered by insurance. So far, the destruction of the condensers has not had any effect on the gas supply of the town. Arrangements have been made for the cooling of the gas by a temporary process, in order that work may be carried on as usual.

Lanark.—At the monthly meeting of the Town Council on Monday, notice of motion was given that at the next meeting a Committee be appointed to obtain information with a view to the Council acquiring the gas-works.

Townhill.—Owing to the main between the Lochside Brick-Works and Townhill being inadequate for the purpose of giving a sufficient supply of gas, a new 5-inch pipe is to be laid from the end of the existing 5-inch main from the brick-works to the centre of Townhill.

Troon.—At a recent meeting of the Town Council, the question of a gas supply to Barassil was discussed; and on the recommendation of the Gas Committee, the Council have agreed to supply gas at 5d. per 1000 cubic feet more than is charged within the burgh.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 14.

Sulphate of Ammonia.

During the past week the urgency of requirements for December shipment has become more apparent, and all parcels offered for sale have been eagerly competed for at steadily advancing prices. The reaction has had the effect of bringing into the market consumers who had been hanging back, and this fact has added further strength to the situation. At the close, the nearest values are £14 5s. per ton f.o.b. Hull, £14 6s. 3d. per ton f.o.b. Liverpool, and £14 7s. 6d. per ton f.o.b. Leith. The improvement for near delivery has been imparted to the forward position, and several transactions have been reported at £14 10s. per ton f.o.b. at the principal ports for January-June shipment. Producers are now asking an advance of 2s. 6d. to 5s. per ton on this figure, but so far buyers have refused to follow.

Nitrate of Soda.

This market continues quietly steady, and quotations are unchanged at 11s. 7½d. per cwt. for ordinary and 11s. 9d. for refined quality, on spot.

LONDON, *Dec.* 16.

Tar Products.

There is very little alteration in the market for tar products. There is practically no change in the value of pitch. Further contracts have been taken for next year's delivery at the equivalent of to-day's prices. Ninety per cent. benzol is decidedly weaker for near delivery; and there appears to be a fair quantity in stock at the present moment in several quarters. Solvent naphthas are fairly steady, although there is very little business doing. Heavy naphthas are firm without alteration in prices. Creosote is exceedingly firm; and business is very good for both prompt and forward delivery. There still appears to be a wide difference as to the value of crude carbolic. Bids are being made on this side in the neighbourhood of 2s. to 2s. 1d. per gallon for forward delivery. On the other hand, consumers will not pay these prices.

The average values during the week were: Tar, 26s. 9d. to 30s. 9d.

COAL STRIKE *VERSUS* WATER GAS PLANTS.

Have you considered the advantages of a

WATER GAS PLANT

for your own Works as adopted at

CLEETHORPES GAS-WORKS	..	Oil or Benzol Carburetting.	
CWMBRAN	,, ..	Benzol	,,
CHELMSFORD	,, ..	Oil	,,
FELIXSTOWE	,, ..	Benzol	,,
ILFRACOMBE	,, ..	,,	,,
NEWTON ABBOT	,, ..	Oil	,,
NEW MILLS	,, ..	,,	,,
PRESCOT	,, ..	Tar	,,
RUSHDEN	,, ..	Benzol	,,
SNODLAND	,, ..	Tar	,,
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London Office: 165, Gresham House, Old Broad Street, E.C.

Pitch, London, 43s. to 43s. 6d.; east coast, 43s. to 43s. 6d.; west coast, Clyde, 43s. to 43s. 6d.; Manchester, 40s. 6d. to 41s. 6d.; Liverpool, 41s. to 42s. 6d. Benzol, 90 per cent., naked, London, 10½d. to 11d.; North, 9½d. to 10d.; 50-90 per cent., naked, London, 10½d. to 11d.; North, 10d. to 10½d. Toluol, naked, London, 11d.; North, 10½d. Crude naphtha, in bulk, London, 5½d. to 5⅝d.; North, 5d. to 5⅛d. Solvent naphtha, naked, London, 1s. 1½d. to 1s. 2d.; North, 1s. 1d. to 1s. 1½d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10½d. to 11d. f.o.b. Creosote, in bulk, London, 3⅛d. to 3¼d.; North, 3d. to 3⅛d. Heavy oils, in bulk, 3⅜d. to 3½d. Carbolic acid, casks included, 60 per cent., prompt east and west coasts, 2s. 3d. to 2s. 4d.; forward 1s. 11d. to 2s. 1d. nominal. Naphthalene, £5 to £9; salts, 45s. to 50s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been a little more business in this article during the past few days, and prices are certainly higher. London makes to-day are quoted at £13 6s. 3d. to £13 7s. 6d.; Leith, £14 2s. 6d. to £14 3s. 9d.; Hull, £14 2s. 6d.; Liverpool, £14 2s. 6d. to £14 3s. 9d.; Middlesbrough, £14 2s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

The stoppage in so large a degree of railway facilities during most of the week has seriously affected the Northern coal trade. The steam coal collieries seemed most to feel it; and thus there were some days without any business of moment. As far as any prices can be given, best Northumbrian steams are from 14s. 9d. to 15s. per ton f.o.b., second-class steams are about 14s., and steam smalls from 11s. to 11s. 6d.; but these prices are mainly nominal. The gas coal trade has the advantage of some collieries having private railways and staiths; so that there have been shipments through these facilities, though not to any very large extent. Over the early part of the week there was practically no quotation of prices, such quantities as were available were being mainly sent on account of contracts. If coal were obtainable, the demand would be full, though some of the chief of the northern gas companies have considerable stocks to tide them over the holiday period, notwithstanding the consumption is for the next fortnight at its highest point. Coke is high in price. The demand for gas coke is very heavy; but the production is also large.

Scotch Coal Trade.

Considerable benefit has accrued to the Scotch coal trade during the week on account of the railway strike on the North Eastern Railway. The stoppage of shipments from the Tyne has caused a diversion of the demand to other centres, in which the Clyde and the Forth ports have shared. On Friday, the following were the prices quoted f.o.b. Glasgow: Steam coal, best, 12s. 6d. to 13s.; splint, 14s. to 14s. 6d.; ell, 12s. 6d. to 13s.; trebles, 13s. to 13s. 6d.; doubles, 12s. 6d. to 13s.; and singles, 12s. to 12s. 6d.

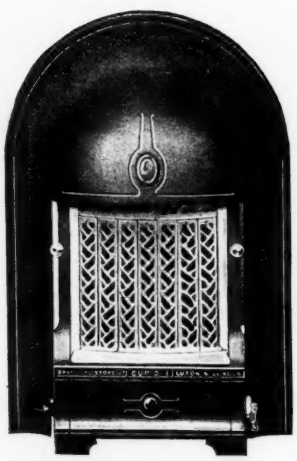
Water Supply to Separate Tenements.

At the Westminster County Court, on Monday last week, before his Honour Judge Woodfall, an action was brought by the Metropolitan Water Board against the London Central Motor Omnibus Company, of Wood Street, Kingston, to recover £3 4s. water-rate for six months. The defendants' premises (a house and a stores yard) were separately rated when the water was first laid on—the house at £32 and the yard at £68 per annum. At the end of March, a new list came into force, and the premises were jointly rated at £128. For the defendants, it was stated that the supply asked for was only for the house, which at the time was in charge of a caretaker. No water was supplied to the adjoining premises, which were used as a garage, where the Company had a well. The plaintiffs, however, claimed that they were entitled to assess on the whole of the rateable value; but it was pointed out that when the Local Authority, who jointly rated the two premises for their own convenience, found out the effect of this on the water-rate, they at once separated the assessments. His Honour held that the house was the portion for which the water was required; and he gave judgment for the defendants, with costs, refusing leave to appeal.

Nuneaton Gas-Works Purchase Proposal.—The Finance Committee of the Nuneaton Town Council reported at their last meeting as to the desirability of purchasing the gas-works, and expressed the opinion that the Council having no compulsory power to acquire the undertaking, the probable cost of doing so would make the proposal prohibitive. The report was adopted.

Littleborough Gas Company's Directors and the Workers.—The good feeling which exists between the Directors of the Littleborough Gas Company and their employees was referred to at a gathering which took place at the works last Thursday evening, when the workmen were entertained at supper. Mr. S. E. Halliwell, the Manager, Engineer, and Secretary of the Company, in proposing the toast of "The Directors," ascribed the continued progress of the concern to the cordial relationship existing between the Directors and the employees. The toast was responded to by Mr. J. C. Hudson, Mr. J. T. Rogers, and Mr. A. J. Law, J.P. The last-named speaker expressed the hope that the present amicable relationships would long continue, as it was necessary for all concerned that such a feeling should exist. It was gratifying that better working results and increased sales had enabled the Directors to improve the position of the employees, as well as to offer benefits to the consumers by reductions in prices. The toast of "The Manager and Secretary" was given by Mr. J. C. Hudson, who paid a warm tribute to that gentleman's management. Mr. Halliwell replied. Other toasts included that of "The Oldest Employee." This is Mr. Richard Ashton, who has been with the Company fifty years.

Gas Fire Supremacy.



Davis's "Cupid" Hygienic Gas Fire.

THIS high-water mark is achieved by a fire when it can be said to be ABSOLUTELY HYGIENIC—when it does not need such accessories as Flue-pipe and Vaporising Pan to correct the evils arising from faulty design—when it has passed a test which has earned the unstinted praise of the highest authorities on gas matters.

Our "New Barless" Fires consist of a long series of units, every one of which exactly complies with the above conditions.

Every fire has passed the SHADOWGRAPH TEST.

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Sales Department and London Showrooms: 59, Queen Victoria St., E.C.
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Sales of Gas and Water Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, the sale conducted by Messrs. A. & W. Richards included two new issues of capital under instructions from Directors. The first lots consisted of £5000 of 5 per cent. preference stock of the North Middlesex Gas Company; and it was all sold at £107 to £107 10s. per £100. Next came an issue of a similar amount of 5 per cent. preference stock and £2500 of additional ordinary stock of the Southgate and District Gas Company. The former fetched the same prices as in the preceding case; and the latter, which carries 7 per cent. dividend from the 1st prox., £134 to £135 10s. per £100. A few fully-paid £10 ordinary shares in the Woking Water and Gas Company, ranking for a maximum dividend of 10 per cent., but at present entitled to 5½ per cent. per annum, were sold at £14 10s. to £14 15s each. Some 7 per cent. ordinary (1882) stock of the South Essex Water Company, carrying the full dividend and any future amount that may be paid on account of arrears, fetched £170 per £100. Next day, 60 additional 7 per cent. shares (sliding-scale) in the Bideford Gas Company realized an average of £18 17s. 2d. each at a sale by auction. At recent sales at Farnham, £10 ordinary shares in the local Gas and Electricity Company realized £15 12s. 6d. and £15 16s. each; while preference shares were disposed of at from £11 10s. to £11 12s. apiece. In the same town, some £10 shares in the Wey Valley Water Company fetched £13 12s. 6d. and £13 16s. per share.

Northam Water Supply.—It has been decided by the Northam District Council to engage the services of Mr. W. H. Thornton to make an examination of the water-works and report on the means of improving the supply. The quantity of water in the reservoir is said to be abundant, but that delivered by the mains is insufficient for the needs of the district. Mr. Thornton will decide whether or not new mains are needed.

Widnes Gas and Water Works Extensions.—At last Tuesday's meeting of the Widnes Town Council, Alderman H. S. Timmis, indicating the nature of the large improvement scheme to which reference has already been made in the "JOURNAL," said the business of the town demanded it. The Gas Committee had seriously considered the advantage of extending the gas-works at a cost of £36,000, and of putting down a new engine at Netherby at a cost of £20,000. When the last extension was completed, it was thought that provision had been made for many years to come. The increased prosperity of the town had, however, made this provision absolutely inadequate. The extensions would not affect the rates. Both the gas and water undertakings were now paying their way; and he anticipated that when the improvements had been carried out the profits would double, and they would be able to make increased quantities of gas on a more economical basis, and thus benefit the town. The whole scheme was approved without the least adverse comment.

The Gas Agitation at Skegness.

"The storm which has sprung up on the Lincolnshire coast regarding the Skegness gas supply," writes a local correspondent, "shows no sign of abating. So dissatisfied are many of the consumers with the alleged inefficient arrangements, under the authority of the Gas Company, that the proposal was seriously mooted, at a recent assembly of the Urban District Council, that independent parliamentary powers should be applied for. It was contended as a justification of the proposal that the Company had violated the statutory obligations under which their Provisional Order was obtained, and that the plant is inadequate to meet the town's requirements. Incidentally, there was an expression of regret at the mistake made by the Council in 1902 in not obtaining the insertion of a purchase clause. Mr. Shelley, who brought forward the resolution, also complained that no gas-testing room, as required by the Provisional Order, had been provided. The Company for years had paid no interest to depositors. The seconder of the resolution, Mr. Frearson, based his contention also upon the fact that the Council would be able to establish before Parliament that the present plant was inadequate. The Company, he opined, would thus be compelled to make application for another Provisional Order, when the Council could obtain the insertion of a purchase clause. But more moderate counsels prevailed; it being pointed out by Mr. Ball that the action proposed to be taken might involve the ratepayers in the expenditure of many hundreds of pounds. The question of the electric light must, he also pointed out, be borne in mind. Eventually the resolution was withdrawn in preference to an amendment, which was adopted, in favour of a deputation of the Council waiting upon the Board of Trade for advice in the matter."

Further Progress of Bills.—In the House of Lords last Friday, the Royal Assent was given by Commission to the Gas Orders Confirmation Bills (Nos. 1 and 2), and to the Water Orders Confirmation Bill (containing the East Surrey Water Order). The House subsequently adjourned till the 14th prox. In the House of Commons, a Bill to confirm a Provisional Order under the Private Legislation Procedure (Scotland) Act, 1899, relating to Kirkcaldy District Water, was presented, read the first time, and ordered to be read a second time on the 23rd inst.

Lighting of Lostwithiel.—Complaint was made at the last meeting of the Lostwithiel Town Council of the condition of the public lighting. The Lighting Committee reported that the newly introduced burners were a failure, and recommended that the Gas Company should be asked to revert to the old system of upright mantles. Mr. Santo thought a mistake was made in introducing the new system generally. In future it would be better to experiment with a few lamps. Mr. Bellringer said he had no doubt the Gas Company would meet them in regard to the cost of altering the burners to a more satisfactory system. The Mayor remarked that the cost must be paid whatever it was. They could not let the town remain in a state of semi-darkness.

THE WILSON "SPIRAL CIRCULATOR."

AN IDEAL HEATER

FOR HARD OR SOFT WATER.

Its unique construction and the process of manufacture make it an appliance which is

UNLEAKABLE & INDESTRUCTIBLE.

IT IS

INTERNALLY HEATED.

THERE IS

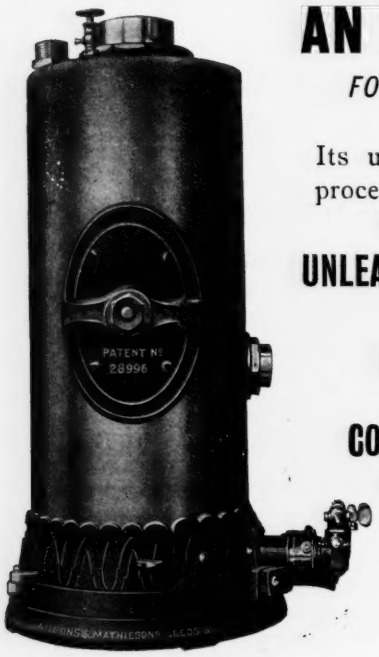
COMPLETE ACCESSIBILITY

To both Water Chamber and Flue-way.

MAINTENANCE

is practically

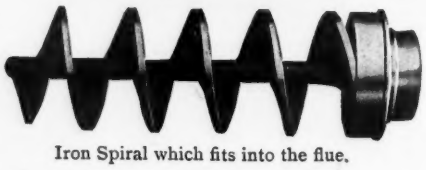
NIL.



"Spiral-Circulator" with Manhole closed.

(Patent No. 28996.)

Plan of Inverted Heater, looking through flue with spiral removed.



Iron Spiral which fits into the flue.

For Full Particulars or Sample of this Water Heater, write to Manufacturers.

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CARLTON WORKS, ARMLEY, LEEDS.

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Improved Public Lighting in Carlisle.—At the meeting of the Carlisle City Council last Tuesday, the Public Lighting Committee recommended the substitution of incandescent burners for the existing flat-flame burners in front streets in the area added to the city under the Carlisle Extension Order, and also in the lanes and courts of the city itself. The recommendation was agreed to.

Automatic Lamp Controllers at Abercarn.—At a recent meeting of the Abercarn Urban District Council, it was considered by the Gas Committee that a large quantity of gas would be saved by using controllers in the public lamps, which number 383, and that the Council would be gainers to the extent of £100 to £120 per annum at the end of three years. They suggested that two-thirds of the controllers should be the "Simplex" and one-third the "Gunfire." This was agreed to.

New Joint-Stock Companies.—The Robin Electric Lamp Company, Limited, has been registered with a capital of £75,000, in £1 shares, to carry on the business of manufacturers of, and dealers in, incandescent electric lamps and gas mantles, burners, and fittings for use in connection with electric light and gas. The Simplicitas G.C. (Parent) Company, Limited, has been formed with a capital of £10,000, in 2s. shares, to acquire the "Presto" lighter and extinguisher or controller, and to apply it, or other form of illumination, for street or public lighting.

Deficiency Rate for the Metropolitan Water Board.—At the meeting of the Metropolitan Water Board last Friday, the Finance Committee presented a report with reference to the levying of a rate equal to 0·9d. in the pound to meet the deficiency of £210,000. It was originally intended to apply for parliamentary sanction to a scheme for liquidating the deficiency; but the proposal was defeated by a small majority. The Committee recommended that the sum required should be apportioned among the contributory authorities, and that the Board should issue precepts for it under section 15 of the Metropolis Water Act of 1902. They stated that the issue of precepts was the only course open to the Board. The recommendation was adopted.

Extensions at Accrington.—The Accrington District Gas and Water Board have applied to the Local Government Board for power to borrow £16,000 for the purpose of the gas undertaking; the greater part of the loan being needed to modernize the manufacturing plant at the Great Harwood works, where there is room for extensions without going outside the site. The scheme includes the provision of mechanical stokers, and the erection of coal breaking, elevating, and conveying plant, together with overhead hoppers for storing and feeding the stoking machine. The machinery will be driven by electric motors and a gas-engine. The only new building to be erected will be the dynamo-house. The stoking-machine will be supplied by Messrs. Aldridge and Ranken; and all the other work will be carried out by Messrs. Robert Dempster and Sons, Limited, of Elland. It was stated at the recent inquiry that, in addition to cheapening the manufacture of gas, the scheme would postpone for many years the enlargement of the retort-house.

Checking Waste of Water at Torquay.—With the object of checking the present excessive consumption of water and preventing waste, the Torquay Town Council have adopted a series of new regulations with regard to fittings and other matters. So as not to inconvenience builders and others who have stocks of old fittings, the new regulations will not come into force until Jan. 1, 1914. From this date a better quality of fittings than that hitherto required will be insisted upon, and there will be a standard of plumbing which will have to be conformed to. By this means it is hoped that it will be possible to reduce the night flow of water, which, according to a recent report of Mr. S. C. Chapman, M.Inst.C.E., the Water Engineer, is still much too high, notwithstanding the efforts to prevent it.

Topsham Water Supply.—At the meeting of the Devon County Council last Thursday, the Main Roads Committee recommended that the Council should consent to the application of the Topsham Water Company for a Provisional Order to supply Topsham with water. An amendment was moved, that consent should be withheld until after a Local Government Board inquiry has been held. It was explained that the Parish Council and the Water Company had brought forward schemes, and that the St. Thomas Rural District Council submitted them to an expert, who condemned both. In the case of the Company's scheme, he said the borehole was perilously near the tidal way, and that pumping would bring in salt water. A geologist, who was also consulted, confirmed this statement. On the other hand, it was pointed out that all the County Council were asked to say was that when the Company had a supply of water the Council would agree to the roads being opened to lay the mains. It was decided by a large majority to await the result of the inquiry before consenting to the scheme.

Phenomenal Yield from a Watershed.—On the presentation of the annual report of the Water Engineer (Mr. F. Howarth) at the meeting of the Plymouth Town Council yesterday week, Alderman Debnam remarked that it disclosed a phenomenon which they did not find in connection with any other watershed in the kingdom. On an average of the past nineteen years, the rainfall over the gathering-ground was 58·48 inches. This was not very remarkable, but the quantity of water which ran into the reservoir from this rainfall was quite exceptional. Eminent engineers who were consulted in connection with the waterworks scheme estimated that one-third of the rainfall would be collected and impounded; but it was proved by up-to-date apparatus that nearly 90 per cent. of the rain which fell on the watershed was gathered into the reservoir. If the earlier estimate had been correct, and only one-third of the water had been impounded, it would now be necessary to construct another reservoir to meet the wants of the population. The quantity of water gathered last year was 5582 million gallons, out of a rainfall of 5931 millions. Mr. Howarth had written to several eminent engineers to ascertain if anything approaching this had been experienced in any other district; but it had not. The only conclusion they could come to was that, by some means or another, the rainfall from a larger area must drain into their catchment area by means of springs. One benefit arising from this was that Plymouth had no reason to apprehend a water famine for the next hundred years.

Parkinson Fires.

The P. S. C. Series.

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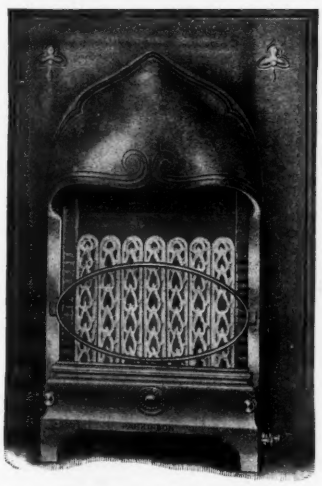
SIMPLE CONSTRUCTION.

ABSOLUTE INTERCHANGEABILITY.

INEXPENSIVELY MAINTAINED.

PRICES from 24s.



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PARTICULARLY SUITABLE FOR HIRING PURPOSES.

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THE "PATHAN."
One of the P. S. C. Series.

THE PARKINSON STOVE CO., LTD.
BIRMINGHAM AND LONDON.

Hyde Public Lighting.—At last week's meeting of the Hyde Town Council, it was resolved that a Special Lighting Committee should be appointed to consider and report upon the whole question of street lighting within the borough; and, further, "that no member of this Council who is a shareholder in the Hyde Gas Company be appointed on this Committee." Mr. Wilde, who was responsible for the resolution, said he did not suggest that any shareholder in the Company would do anything unfair to the ratepayers, but there was a feeling in the town that previous Committees had been so dominated by gas shareholders that the business had not been discussed as it ought to have been.

Price of Gas at Burton-on-Trent.—At the monthly meeting of the Burton-on-Trent Town Council last week, a formal notice of motion was received from Alderman Lowe, the Chairman of the Gas and Electricity Committee, to reduce the price of gas per 1000 cubic feet as follows: For ordinary purposes, 2d.; for motive power or other manufacturing purposes, 1d.; supplied through prepayment meters, 4d. It is proposed that the two first-named reductions shall come into operation from the dates of reading the meters for the quarter ending the 31st inst.; and that the mechanism of the prepayment meters shall be altered to enable the reduction to be carried out as soon as convenient after the meeting of the Council next month.

Withnell Gas and Water Finances.—In his report on the accounts of the Withnell Urban District Council for the past financial year, Mr. N. H. Griffiths, the District Auditor, points out that for the first time the water undertaking shows an excess of receipts over expenditure of £89, which had been handed over in relief of rates. On the gas undertaking there was an excess of expenditure over receipts of £211, due to extraordinary outlay. Mr. Griffiths adds: "It is again my duty to insist on the necessity for strengthening the cash resources of the Council. The revenue account at the end of the year was overdrawn £405; and unless I am satisfied that a genuine attempt is made to remedy this, I shall be compelled to take further steps."

Water Charges for Non-Provided Schools.—At the meeting of the London County Council on the 19th ult., the Local Government, Records, and Museums Committee drew attention, as already recorded in the "JOURNAL," to the proposals of the Metropolitan Water Board to alter the method of charging for water supplied to non-provided schools, the effect of which will be to increase the amount payable in respect of these schools by about £600 a year, of which about £38 is recoverable from the managers. The Board have now agreed that the new charges shall operate as from the 1st prox.

Intimation has been received by the Clerk to the New Mills Urban District Council that the Local Government Board have sanctioned the borrowing by the Council of £10,000 for gas-works purposes. The greater part of the money is required in connection with the extension of the gas supply to the neighbouring township of Disley.

"The new system of inverted incandescent gas-lamps just installed at the Redland Free library," says a local paper, "affords the greatest satisfaction to those who are regular users of the newspaper department and reading-room. The light is singularly clear and penetrating, with quite an absence of glare, which is so tiring for the eyes of readers. The scheme is the latest to be introduced by the Bristol Gas Company, and is one which might with advantage be extended."

Viscount Hythe, speaking on "Labour Co-Partnership as a Remedy for Industrial Disputes," before a meeting of the London Chamber of Commerce last Tuesday, pointed out that the worker must not be asked to make any sacrifice, and that it must be recognized that he could not share losses. Moreover, the bonus offered must not be looked upon by the employer as a means of keeping down wages. Capital, he said, had a right to its wages just as a workman had a right to be paid. The wages of capital might be fixed at 5 per cent. or more, according to the nature of business. After 5 per cent. had been paid, the worker should be credited in the bonus fund with a percentage on his wages at the same rate as the dividend to shareholders above 5 per cent.

GAS COMPANIES' STOCK AND SHARE LIST.

Things on the Stock Exchange changed last week decidedly for the worse. Labour troubles at home and international troubles abroad were the sinister factors, and quite potent enough to upset markets seriously. They bore up courageously against the persistent pressure of sales engineered by Continental Bourses; but they could not escape altogether scot-free. High-class securities were conspicuous sufferers, and Consols lost a whole point in the week. One small failure was announced. The opening day was far from promising, and markets showed symptoms of fatigue. Government issues were dull, and Consols lost ¼. Rails disliked the fresh trouble in Gateshead, and prices receded. Americans were lower. Tuesday was quite flat in pretty well every quarter. Gilt-edged weakened, and Consols receded ¼ money and ⅜ account. Rails were depressed by strike news; and Americans showed considerable losses throughout the list. Wednesday was another bad day, though opening fairly. First one thing began to fall; then others became unsettled in turn. Government issues gave way, and Consols fell ¼. Rails hesitated and then receded. Americans wobbled till the afternoon, and then went all to pieces. Business was very quiet on Thursday; interest bulking in the settlement, not devoid of anxiety. Markets were flat generally; Americans being the storm centre. Consols were ⅛ lower. Depression was marked on Friday. Consols receded another ⅜, Rails were in very poor spirits, and the Foreign Market was a prey to sales. Saturday was quiet, and movements were irregular, though showing some improvement. Consols recovered ⅛—closing at 74⅛ to 74¼. The Money Market was very firm. There was a good demand for short loans; and discount rates hardened steadily. Business in the Gas Market was less active than the week before; and the whole aggregate of it was confined to only a few issues. Not many changes of quotation were marked; and of these more than half were merely *ex div.* variations. However, the substantive changes were all for the better. Dealings in Gaslight and Coke issues were almost wholly restricted to the ordinary, which was very firm. Prices ranged from 105⅝ to 106¼; and the quotation was put up 1. The preference stock was done at 101; and the debenture at 76 *ex div.* South Metropolitan was strong and quiet; transactions realizing from 117 to 118¼. The debenture fetched 77⅜ and 78. Nothing at all was done in Commercials. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 75 and 78, Bournemouth "B" at 16⅛, ditto preference at 14⅛ and 14 3/32, Brentford new at 202, South Suburban at 120, Tottenham debenture at 94½, and (on the local Exchange) Sheffield "A" at 232—a rise of 1. In the Continental companies, Imperial was marked at 176 to 177¾, ditto debenture at 87⅛ and 87⅞, Union at 87 and 88 *cum div.*, European at 19⅜ and 19⅞, and Malta at 4½. Among the undertakings of the remoter world, Bombay changed hands at 6 9/16 and 6¾, Cape Town at 2⅛, Primitiva at 6 7/16 to 6⅝, ditto preference at 5 3/32 to 5 5/16, ditto debenture at 96½ (a rise of 2), River Plate debenture at 95½, and San Paulo preference at 11½.

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 11	5	Alliance & Dublin Ord.	75–80	..	6 5 0
374,000	Stk.	July 12	4	Do. 4 p.c. Deb.	89–91	..	4 7 11
250,000	5	Oct. 11	7½	Bombay, Ltd.	6⅜–6⅝	..	5 9 1
50,000	10	Aug. 29	15	Bourne- mouth Gas & Water Pref. 6 p.c.	29–30	..	5 0 0
332,000	10	,,	7		15⅜–16½	..	4 6 2
75,000	10	,,	6		14–14⅜	..	4 2 9
390,000	Stk.	Aug. 14	13½	Brentford Consolidated	257–262	..	5 3 1
330,000	,,	,,	10½	Do. New	198–203	..	5 3 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	116–118	..	4 4 9
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.	94–96*	..	4 3 4
218,230	Stk.	Aug. 29	11	Brighton & Hove Orig.	210–215	..	5 2 4
244,200	,,	,,	8	Do. A Ord. Stk.	5 3 3	..	5 3 3
530,000	20	Sept. 27	12½	British	44⅛–45½	..	5 9 11
130,000	Stk.	June 28	4	Do. 4 p.c. Deb. Stk.	91–93	..	4 6 0
245,771	Stk.	June 28	4	Buenos Ayres 4 p.c. Deb.	94–96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	2–3	..	—
160,000	10	—	—	Do. 4½ p.c. Pref.	3⅛–4⅛	..	—
100,900	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	70–73	..	6 3 3
157,150	Stk.	Aug. 29	5	Chester 5 p.c. Ord.	110–112	..	4 9 3
1,518,280	Stk.	Aug. 29	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do.	101–103	..	5 3 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.	71–73*	−½	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	83–86*	..	4 13 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	130–132*	+½	5 6 1
492,270	Stk.	—	5½	Derby Con. Stk.	124–125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103–105	..	3 16 2
1,002,180	10	July 26	10	European, Ltd.	19–20	..	5 0 0
16,160,600	Stk.	Aug. 14	4/17/4	Gas- light and Coke	105–107	+1	4 11 0
2,600,000	,,	,,	3½		82–85	..	4 2 4
4,062,235	,,	,,	4		100–102	..	3 18 5
4,531,705	,,	Dec. 12	3		75–77*	−½	3 17 11
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	91–93	..	5 7 6
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	16–16½	..	6 13 4
131,000	Stk.	Sept. 13	7⅜	Ilford A and C	154–157	..	4 17 1
65,780	,,	,,	6½	Do. B	121–123	..	4 19 7
65,500	,,	June 28	4	Do. 4 p.c. Deb.	91–93	..	4 6 0
4,940,000	Stk.	Nov. 14	9	Imperial Continental	175–180	..	5 0 0
1,235,000	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	86–88	..	3 19 7
200,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	122–125	..	4 16 0
561,000	Stk.	Aug. 29	10	Liverpool United A.	223–225	..	4 8 11
718,100	,,	,,	7	Do. B.	161–163	..	4 5 11
306,083	,,	June 28	4	Do. Deb. Stk.	100–102	..	3 18 5
63,480	Stk.	June 28	3	Maidstone 3 p.c. Deb...	69–71	..	4 4 6
75,000	5	Nov. 28	6	Malta & Mediterranean	4⅛–4⅜	..	6 6 4
250,000	100	Oct. 1	4½	Met. of Melbourne 4½ p.c. Deb.	99–101	..	4 9 1
541,920	20	Oct. 30	3½	Monte Video, Ltd.	12–12½	+½	5 12 0
1,775,892	Stk.	July 26	4½	Newc'tle&G'tesh'd Con.	99½–100½	..	4 7 1
529,705	Stk.	June 28	3½	Do. 3½ p.c. Deb.	87–88	..	3 19 7
55,940	10	Aug. 29	7/7/0	North Middlesex 7 p.c.	13½–14½	..	5 1 5
800,000	Stk.	Nov. 28	8	Oriental, Ltd.	125–130	..	6 3 1
60,000	5	Sept. 27	10	Ottoman, Ltd.	5⅛–5⅜	..	5 14 3
60,000	50	Aug. 14	13	Porisea Island B	127–130	..	5 0 0
100,000	50	,,	12	Do. C	124–127	..	4 14 6
249,980	5	Oct. 11	8	Primitiva Ord.	6⅛–6⅜	..	5 18 6
499,960	5	June 28	5	Do. 5 p.c. Pref.	5–5½	..	4 15 3
521,600	100	D. c. 2	4	Do. 4 p.c. Deb.	96–98	+2	4 1 8
846,198	Stk.	June 28	4	River Plate 4 p.c. Deb.	94–96	..	4 3 4
275,000	5	Apl. 12	12	San Paulo, Ltd.	13–14	..	4 5 9
150,000	10	Sept. 27	6	Do. 6 p.c. Pref.	11½–12	..	5 0 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49–51	..	4 18 0
135,000	Stk.	Aug. 29	10	Sheffield A	231–233	+1	4 5 10
209,984	,,	,,	10	Do. B	230–232	..	4 6 2
523,500	,,	,,	10	Do. C	229–231	..	4 6 7
90,000	10	Sept. 27	7½	South African	9½–10½	..	7 2 10
6,429,895	Stk.	Aug. 29	5/9/4	South Met., 4 p.c. Ord.	117–119	..	4 11 9
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	76–79	..	3 15 11
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	163–165	..	5 3 0
605,000	Stk.	Aug. 14	5/16/8	S'th Suburb'n Ord. 5 p.c.	119–121	..	4 16 3
60,000	,,	,,	5	Do. 5 p.c. Pref.	117–119	..	4 4 0
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120–122	..	4 2 0
594,740	Stk.	Nov. 14	5	Southampton Ord.	102–105	..	4 15 3
120,000	Stk.	Aug. 14	7½	Tottenham A 5 p.c. and B 3½ p.c.	142–145	..	5 0 0
483,940	,,	,,	5⅝		115–117	..	4 18 3
149,470	,,	June 28	4	Edmonton 4 p.c. Deb.	94–96	..	4 3 4
182,380	10	June 15	5	Tuscan, Ltd.	8½–8⅝	..	5 15 11
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97–99	..	5 1 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	115–115½	..	4 6 7
255,636	Stk.	Aug. 29	6¾	Wands- B 3½ p.c.	139–142	..	4 16 10
85,766	,,	June 28	3	worth 3 p.c. Deb. Stk.	70–72	..	4 3 4

Prices Marked * are "Ex. Div."